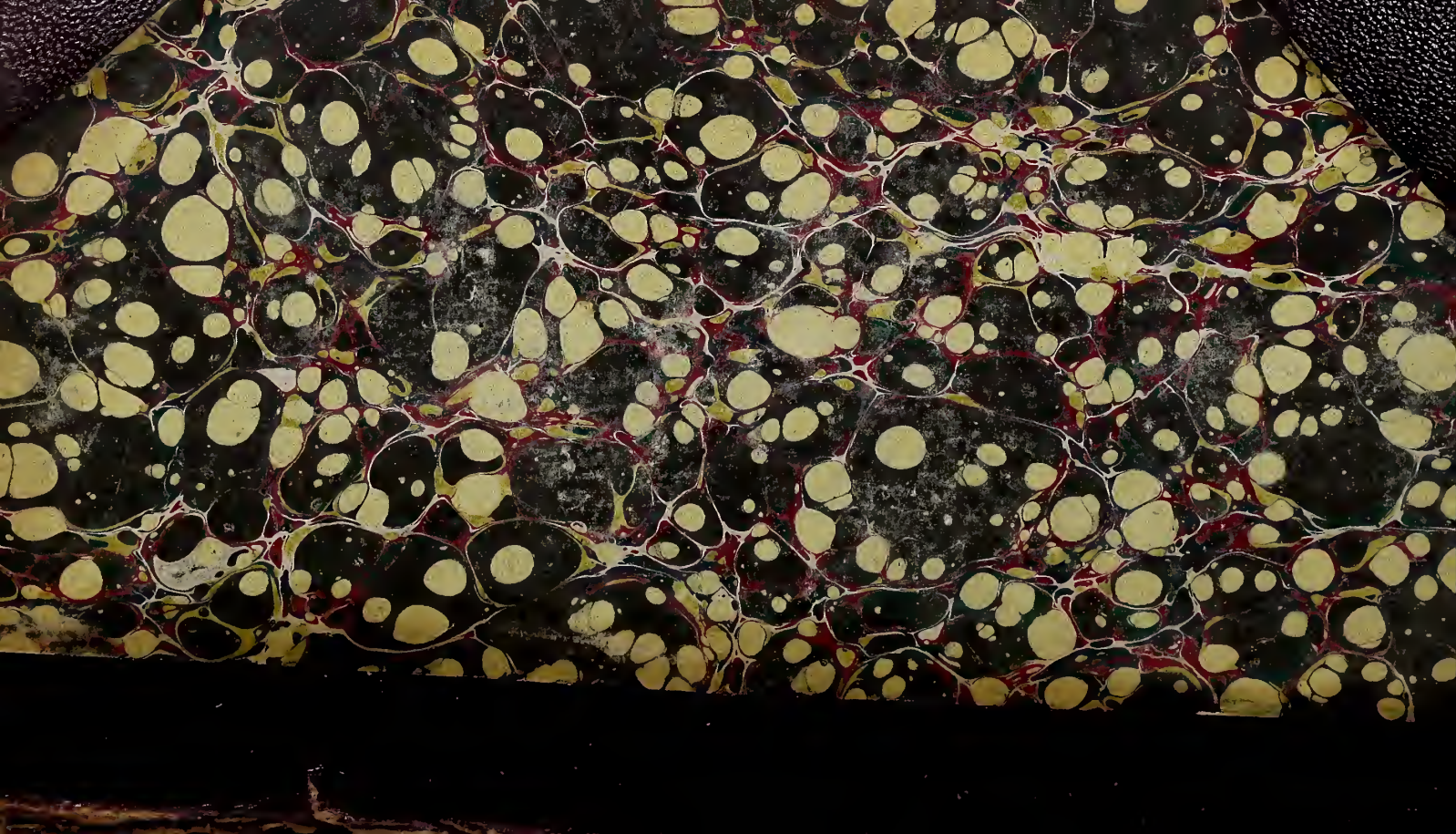

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I.—*Geological Notes on the Northern Conkan, and a small portion of Guzerat and Kattywár. By* Charles Lush, *M. D.*

[Communicated by the Medical and Physical Society of Bombay.]

In a paper which recently appeared in the Journal of the Asiatic Society of Bengal by Dr. Benza, on the Geology of the Nilgherry hills, it is remarked that "the elevation of this plateau, and probably the whole chain of the Western Ghats, of which the Nilgherries are the southern termination, happened at a period long anterior to the existence of life on our planet."

This appears, at first sight, a bold and sweeping conclusion: but I apprehend that those who have travelled in the *Dekhan*, the *Southern Conkan*, and that part of the *Carnatic* termed with us "*Southern Maratha country*," will not only be ready to concur in this opinion, but perhaps to extend it so far as to doubt the existence of any formation containing fossil remains in any part of Western India to the southward of *Cutch*.

In that province, it has been stated that oolite occurs. I believe, however, that no sufficient investigation has been made into this fact, to entitle us to assume the identity of such shell-stone with the recognized oolitic formations of other countries, so as to satisfy the rigorous views of a modern geologist.

There is a new era in geology. It is now in the power of any person who travels through countries where "the crust of the globe is untouched by the hammer of the geologist," to contribute to the advancement of this, the youngest of the sciences. By avoiding

speculations, not even giving a name to that which is found,—by carefully noting the site of specimens collected, according to the directions published by the Geological Society of London,—by forwarding collections to those persons who are best capable of comparing and identifying fossil remains,—materials will gradually be formed for a geological map of India, as well as for the development of sound doctrine regarding the mode and date of deposits. Let the traveller who goes northward over the plateau of the *Dekhan*, or who follows up the coast of the *Conkan*, conclude with Dr. Benza that the primary, the trap and the laterite rocks—nay, even the alluvial covering these, are antecedent to the existence of animal life on our planet. But, on finding in parts of the *Southern Conkan*, and especially in the island of *Bombay*, horizontal strata of sandstone containing shells, it would be well to look with more suspicion to the northward, and to be prepared to doubt the non-fossiliferous character of the rocks. The shell-stone of *Bombay* will, I hope, be investigated agreeably to modern rules, and materials furnished to those who are capable of deciding whether any, or what proportion of the shells belong to extinct species. It is easy to name this stone "coral rag," and it would cost no labour to speculate upon its being simply a deposit actually going on at the bottom of the *Bombay* harbour; a deposit here and there brought to light in consequence of portions of the present island having been gained from the sea since the place became a settlement. This question can only be determined in one mode;—by the examination and comparison of a few hundreds of species of shells. Decide then whether all are existing, or part extinct. Leaving this important matter for the investigation of some persons at the Presidency, I proceed to copy a few notes collected in a tour through the *Northern Conkan*, part of *Guzerat*, and *Kattywár*.

The most remarkable geological feature in the *Northern Conkan* between *Bassein* and *Surat*, is the extensive degradation and partial reproduction of land at different periods. Occasionally, denuded-strata are met with, the date of which can alone be determined by the nature of their organic remains. The first place at which I remarked strata of sandstone similar to those of *Bombay*, was at *Mahim*, (*Northern Conkan.*) There is a low cliff of from ten to twelve feet in height, composed of horizontal strata from one to three or four inches in thickness. On leaving the town of *Mahim* the road passes over a tract of some extent formed of these shell strata, which after some intermediate alluvial, which conceals the nature of the subjacent formation, reappear at the coast under the fort and public bungalow of *Seergaum*.

As there has been a great destruction of land at this place, the cliff under the bungalow may be viewed with interest. It averages about 20 feet in height above the ordinary level of the tides. The upper five feet is alluvial, the lower fifteen feet consisting of horizontal strata of sandstone in different states of aggregation. Nearly at right angles with the fort of *Seergaum*, a point of land runs out towards the sea, of the same general aspect as the strata just described. This seems to have been once continuous with another portion reaching out from the coast, at a distance of about five miles to the northward. The natives state that the whole bay was once land. The destruction seems to have stopped for the present at a Mussulman burying ground, where human bones may now be seen exposed; and which the fossil seeker must be careful to distinguish from "organic remains of a former world." If after another shifting of place between sea and land, a deposit should be formed above, so as to press and solidify the sand, containing skeletons, a mistake of this kind may as easily occur here, as it did at *Guadaloupe*.

The road through *Tarapúr*, *Dannú* and *Jyebúrdí* affords many opportunities of seeing sections of these strata,—all horizontal and evidently above the trap. Trap rocks still form the gradually diminishing hills inland, being the continuation of the Western Ghat range. Where the trap is exposed, as in some of the numerous creeks, it presents the same weather and water-worn appearance as in the rivers of the *Dekhan*.

It has been assumed (seemingly by Professor Jameson*) in a late summary of the geology of India, that the trap formation reaches to the *Nerbudda*. I therefore presume that there exists no written evidence to the contrary. This mistake has probably arisen from rolled pebbles of trap having been seen in the bed of the *Nerbudda*, opposite the *Kabbír Bar* a few miles above *Broach*; or it may have been a simple conjecture. The fact is, that the trap ceases on the coast between *Balsár* and *Gandávie*. The last hills being those called *Dúngrí*, a low range near the village so called, scarcely more than 100 feet in height and composed of porphyritic trap. The well known hill fort of *Punera*, near the town of *Balda Párí*, is the last trap hill of any height in this direction. At *Gandávie* are strata of clay, containing *kankar*, and from this point we take leave of trap, as well as of shell *sandstone: kankar*, and clay of various forms now present themselves in the only sections seen from *Gandávie* to *Surat*. The form and situation of the *kankar* at *Dúmus* demands future notice. The point of geological interest about *Surat* is the constant destruction and partial

* Vide British India, vol. iii. Art. Geology.

renovation of land. But especially we note here destruction and *degradation* by freshes and spring tides, where the water is all powerful, and there are no "antagonist forces," such as are imagined by those who are inclined to slight actual causes, and to controvert the principles so ably developed by Mr. Lyell. I cannot avoid here remarking, as it is a point so àpropos to the country under consideration, that a strange assumption has gone forth with regard to the powers and magnitude of tropical vegetation and its agency on the crust of the globe; as if it were a *general* law of nature that the nearer we approach to the equator, the thicker the vegetation. So that tropical vegetation must have essentially a greater power of resistance to the destruction of land than extra-tropical. Such a position is manifestly untenable on the old continent, whatever ground there may be for the opinion in the *West Indies* and *South America*. In *Guzerat* and in the *Dekhan* bareness of natural vegetation is the prevailing character; while even in *Malabar*, where the most rank vegetation exists, I have been shewn such devastation from the sea alone, that I am inclined to think that no "antagonist power" of vegetation can be worth considering. An eminent geologist*, adverting to the doctrines of Mr. Lyell, asks, "Are there no antagonist powers in nature to oppose these mighty ravages? no conservative principles to meet this destructive agency? The single operation of vegetation is a vast counterpoise to all." (!)

Should we interrogate nature in *Guzerat*, especially about the *Taptí* and *Nerbudda*, we shall find that the conservative principles of vegetation stand no chance against the destructive agency of water.

On the plateau of the *Dekhan*, degradation can only be slightly repaired in one place, by the operation of degradation from a higher level and subsequent deposit below. At the level of the sea in the *Northern Conkan* and in *Guzerat* the rains carry away vegetable mould and vegetation with it. The denuded tracts support no vegetation capable of protecting the land on which it grows from farther loss. The tides with the small portion of sediment they deposit, bring no contribution to vegetable soil. Should they throw up a shoal between the periodical rains, the next fresh would certainly carry it away. The "antagonist powers" are here freshes and tides, but they both tend to the destruction of vegetation, and to throw insuperable obstacles in the way of its renewal.

Proceeding from *Surat* through *Oolpar* to the *Kim* river, nothing but black cotton soil occurs until you cross the *Kim*, at the village

* Professor Sedgwick.

of *Kudrama*,—there sandstone and conglomerate are exposed at the surface.

River Kim, section of the right bank at Sawal.

No. 1. Alluvial containing irregularly imbedded masses of conglomerate, 6 feet.

No. 2. Three feet of horizontal strata of sandstone from one to two inches in thickness.

No. 3. Five feet of sandstone varying in hardness.

No. 4. Bed of the river, consisting of coarse conglomerate, coarser than the imbedded masses No. 1.

There is no sign of stone of any kind on the left *Oolpar* bank of the *Kim*. This formation of conglomerate and sandstones, is only known in this tract of country to extend from the village of *Koba*, through *Elao* and *Sawal* to *Súnú*.

There is reason to believe that the same rocks form the *Raj-pípla* range of hills and portions of the peninsula of *Kattywár*. The central ridge of *Kattywár*, of which the celebrated hill of *Politana* forms a part, is undoubtedly trap, the usual varieties of which are met with at *Baunagar*. The most remarkable part of this formation (of sandstone, &c.) is the cornelian deposit at the celebrated mines near the *Nerbudda* at *Rattanpúr*. These mines were described by Mr. Copland, Trans. Lit. Soc. Bombay. The general account is correct, but Mr. C. is in error with respect to the appearance of igneous action upon the hill of *Bawa Gorea*, which consists of sandstone and conglomerate rocks,—but not a trace of trap.

Leaving the town of *Okleysir* on the south bank of the *Nerbudda**, on the road to the cornelian mines through *Sarapúr*, *Clareville* and *Rappalsárí*, the flat black cotton soil plain gradually begins to undulate; and in a nullah near the new village of *Clareville* I saw the first appearance of stone (kankar of course excepted) even in fragments since crossing the *Kim*. The masses were sandstone and conglomerate. The soil now mixed with sand here gradually loses its tenacity and fitness for cotton cultivation. At length, under *Rattanpúr*, the place where the cornelians are brought to undergo the process of baking, a clear section occurs on the bank of a nullah or small river of rather saltish water opposite the village, shewing under a superficial stratum of alluvial, 5 feet thick strata of sandstone, 25 feet deep, inclined at an angle of about 70°.

* From *Hansót* to *Sugód* (and I presume farther) may be seen a deserted bed of the *Nerbudda*, the bank varying in height, consisting of clay with regular horizontal deposits of kankar. The large tank at *Sujód* is evidently a portion of the old bed of the river.

The direction of these highly inclined strata is N. E. and S. W., corresponding to similar strata on the opposite or *Rattanpúr* side of the nullah,—dip N. W. The extent of this section, as far as it is well exposed, is about 40 feet of the bank.

The banks of the nullah above *Rattanpúr* shew irregularly stratified masses of a compact earthy rock with dendritic figuring ; also a conglomerate containing some appearances, though not quite unequivocal, of fossil bone. These are not accompanied, as far as I could observe, by fossil shells, and it is only from having since found undoubted fossil matter in similar deposits that I have thought them worth forwarding for comparison.

This nullah contains rolled masses of jaspers, various agates, &c. &c., but no trace of a rolled piece of any variety of trap as may be seen in the bed of the *Nerbudda* near the *Kabbír Bar*.

In the village of *Rattanpúr* the cornelians are collected and exposed to the air for a month or two. If on being chipped they are found likely to be worth working, they are put into earthen pots (the usual water pots) with some earth and sand, and exposed to a fire for a day and night. At the end of the hot season they are sent down the *Nerbadda* by way of *Broach* to *Cambay*, to be cut and polished.

The cornelian mines are about four miles from *Rattanpúr* in a thick jungle. The people who work them return every night to *Rattanpúr*, there being no habitations near the mines. From the principal spot now working the following small hamlets are thus distanced.

Damláe, one mile south.

Ahmod, one and half mile north.

Padwana, 3 miles south-east.

To the eastward all is jungle.

The stones are said to be found over a space of about four miles.

The formation containing cornelians is a deep bed of red gravel, very like the London gravel: in it are found pebbles of various form and size, of the different species or varieties of chalcedony,—irregularly imbedded, and not in layers like flints in chalk.

The mines are usually sunk to about thirty feet, but on digging to sixty feet neither hard rock nor water is met with. I therefore conclude that this is a partial deposit entirely above the sandstone-conglomerate formation, which is denuded at the surface of the nullah before mentioned, which forms also the *Bawa Gorea* hill, and I believe the general range of the *Raj-píplas*.

As far as I could observe, there is no sign of organic remains in these gravel beds,—but every thing hereabouts should be examined carefully, as the building stones in several of the villages contain

fossil shells; so that if the people could trace them to the quarries, it might lead to some interesting discoveries in the *Raj-pípla* range.

I saw no sign of this formation from *Broach* to the *Maihí* river, opposite *Cambay*, nor on the *Tankeria Bunder* side of the gulf.

The next point at which I found conglomerate rock was at *Gogo* in *Kattywár*, where masses of rock containing shells are dug out from the beach, the upper portions having been carried away by the encroachments of the sea.

This formation will, I hope, be soon traced up the south-eastern to the western coast of *Kattywár*. I before observed that the rocks at *Baunagar* are trap. Now these conglomerates appear to contain fragments of a great variety of mountain rocks, always excepting trap. This circumstance affords suspicion that the trap was thrown up subsequently to the deposit of the conglomerates. I say merely suspicion, as I know of no evidence of upheaving, nor the nature of the strata at the points of junction. These, between *Gogo* and *Baunogal*, are either obliterated by extensive degradation, or concealed by deposits of mud.

The island of *Perim* in the gulf of *Cambay*, afforded me a better opportunity of examining the conglomerate than the denuded beach of *Gogo*.

Perim is about three miles in circumference. About half the island, proceeding round the western side towards the southernmost point, consists of strata of conglomerate rock much acted upon, but forming cliffs in several parts to a height of about 30 feet above the sea, the upper strata being of compact sandstone,—all perfectly horizontal. The conglomerate contains shells and other fossils, some undoubted bones, &c. which have been forwarded for identification to *Calcutta*.

Fine sand,—partly from the decomposition of these rocks, but chiefly, perhaps, thrown up by the tides from the opposite coast, —appears to have been blown by the south-west monsoon, so as to form *dunes* of very singular aspect, mostly rounded at the top. In one place a sand hill has a quadrangular platform-like summit. These sand-mounts seem to have formed a barrier to the farther encroachments of the sea. There is a valley to the eastern side of the island partly in turf, and some part cultivated open to the sea, where one may walk with a firm footing, while the sandy *dunes* of the higher level give way in every direction.

Proceeding from the south point towards the eastward (the open valley), layers of kankar are met with *below* the sandstone,—beyond this is a low cliff of sand,—the valley completing the circuit.

In the hope that some of our members stationed in *Guzerat* will carry on the investigation of the fossils, not only of *Perim*, but of other parts of the formation in *Kattywár*, I have hastened to lay before them this imperfect sketch, without waiting for a report on the *nature of the fossils* found, or presuming myself to offer any opinion, or to draw a conclusion on that part of the subject.

II.—*Note on Mastodons of the Sewaliks.* *By* Capt. P. T. Cautley, *Superintendent of the Doab Canal. Pl. XL.*

In the present state of the researches into the fossil remains of the Sewaliks, it will be interesting to note any discovery of peculiar interest, without entering upon a description in detail. Such a description may, with propriety, be reserved, until the possession of a more perfect and a more numerous collection of remains enables us to enter upon the description with greater confidence: whilst, in the mean time, to those who are interested in the study, the periodical announcement of progress made in our operations, cannot be devoid of interest; under this idea I did myself the pleasure of forwarding to your Society the note on the dentition of the *Mastodon Angustidens* (variety of), and now send you one on a skull of another variety of Mastodon which has been lately received. The sketches are drawn on transfer paper, and will, I hope, be intelligible.

Fig. 1 and 2, are representations of the fossil skull—Fig. 1 being the front, and Fig. 2, the profile or side view. Fig. 3 and 4, are similar outlines of the existing elephant, on a scale of one-eighth on linear measurement.

The fossil is exceedingly perfect in some respects. The left orbit and maxillaries are as sharp and well defined as in the recent skull; the frontal and nasals are tolerably perfect, the specimen is fractured obliquely, removing the temporal swellings and diploe of the cranium, together with the occipital condyles and foramen magnum; the curve of the occipital on its external surface is however retained, and although sutures are altogether wanting, and the alveoli of the tusks are mutilated, the specimen may be considered as sufficient to give a perfect idea of the form of skull; and, as a form perfectly unique amongst the proboscidean pachydermata, will be looked upon with satisfaction by all those who take interest in the additions that have of late years been so rapidly made to palæontology, and the catalogue of animals now no longer existing on the globe. The present skull derives additional interest from its being so different from the only

Fig: 1

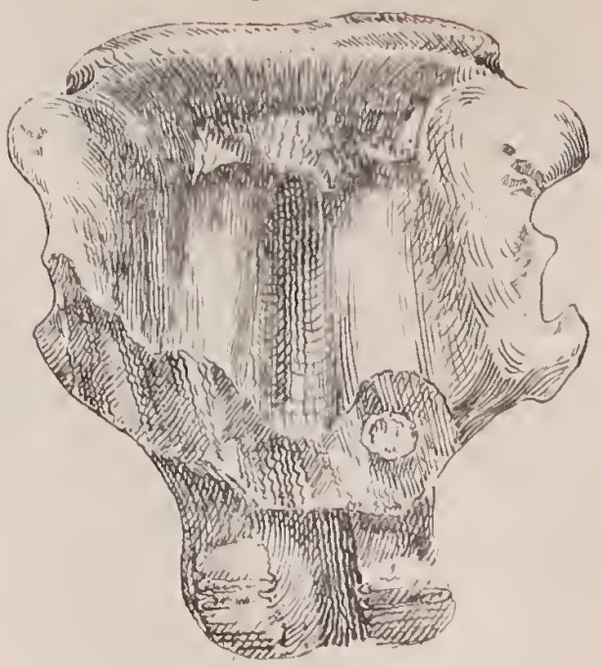


Fig: 2.

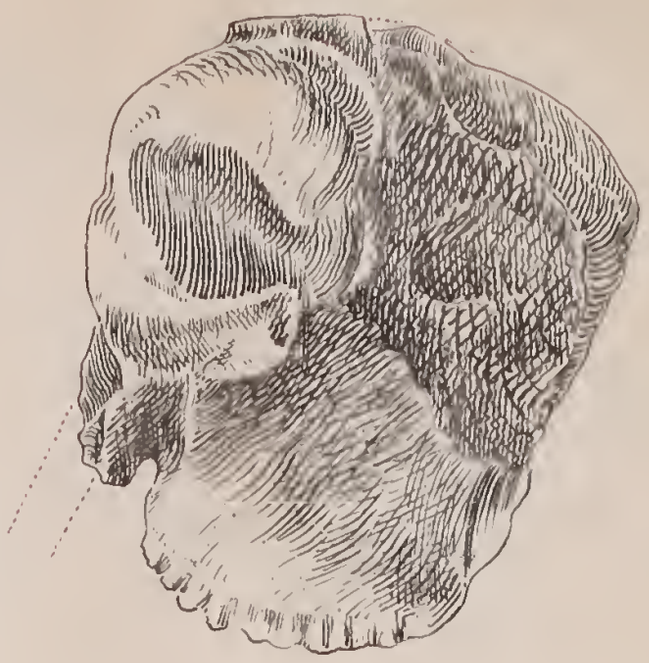


Fig: 3.

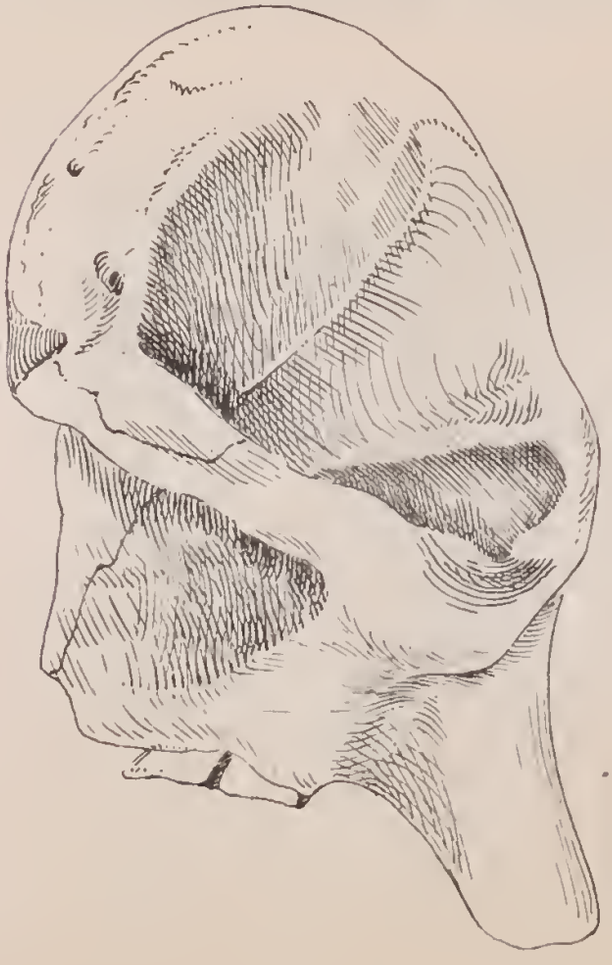
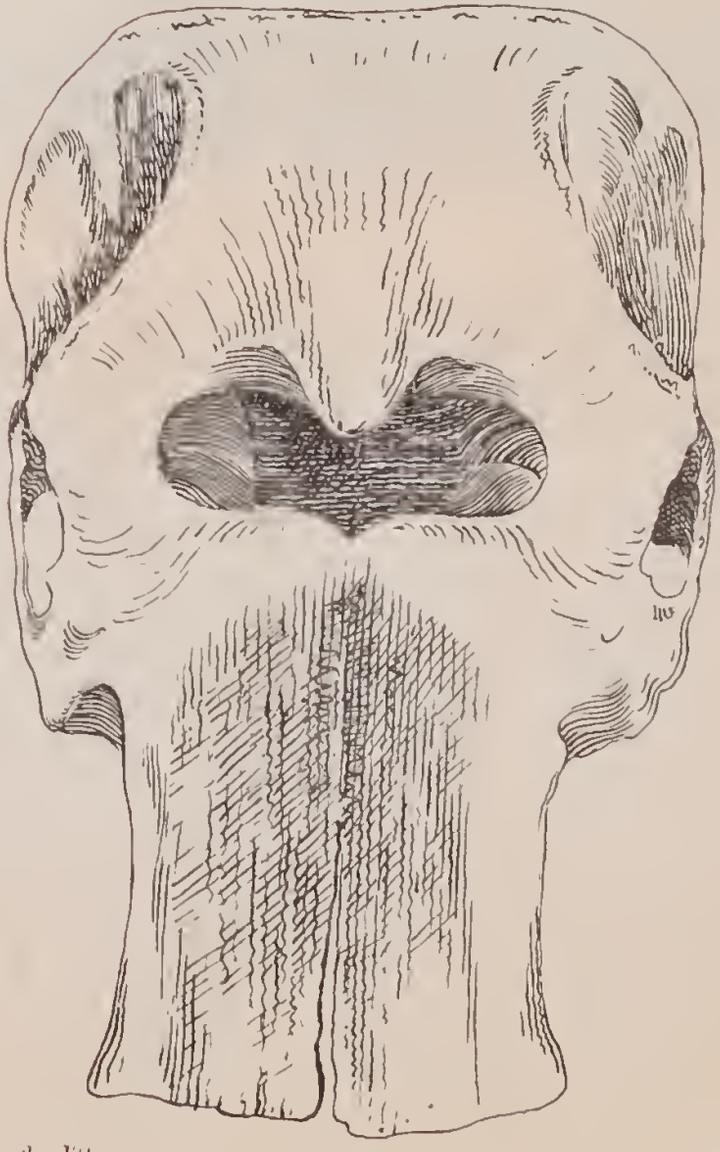


Fig: 4.



P. T. Caulley lithog.

type of the same genus or co-genus (for it may be permitted so to designate the elephant) which has been left to us—so different indeed, as to completely modify the construction of the head, and the arrangement of the muscular and fleshy matter that must have belonged to it.

Without entering into any minutiæ of detail on the peculiarities of the head, of which the drawings will give a representation, and which detail will be reserved until our collections enable us to bring under one view all the varieties of this genus that the Sewaliks may contain, it will be sufficient, in announcing this very interesting addition to our cabinet, to draw attention to a few leading points.

In the skull of the existing elephant, the excess of longitudinal measurement, over that in the contrary direction, owing to the great development of the superior portion of the cranium, is one of the most marked peculiarities of its form; the height from the external nasal opening to the top or apex of the cranium is immense, although undergoing modification from age; this excessive development not being derived from any increase of size to the cerebral cavity, but to a wide space composed of cellular bone or diploe, giving an external and deep covering to all that space occupied by the brain; the size of the orbit is small with comparison to the temporal region; the large external nasal aperture is situated between the orbits; and the front in the Indian species is slightly depressed:—now in turning to the fossil, we find that the whole of these peculiarities, are either reversed, or modified in an extraordinary degree.

The elevated and massive cranium does not exist, the slope towards the occipital and foramen magnum commencing from the top of the external nasal opening, and falling off to the rear in an abrupt angle; the size of the orbit is large, and its encircling bones massive and prominent; the space between the orbits to the front continued up to the nasal opening, is depressed to an enormous extent, and the two lines of alveoli of the tusks strongly marked; the temporal fossæ are comparatively small with those of the existing elephant, and the temporal bones; which although broken off in the specimen from which the drawing is taken, exists in another skull in our possession, appearing to be large and composed of cellular bone. The angle formed by the tusks with the grinding surface is more obtuse than in the existing elephant, and the form of head, instead of possessing the proportion assimilating the skull of the elephant to that of man, may be considered as nearly square, or perhaps possessing a breadth in greater proportion than the length. The height of the maxillary bones which is great in the elephant, is here much exaggerated, and

the form and profile especially is so peculiar, that a glance at the sketch will, by comparison with that of the existing elephant also given, be sufficiently striking.

The suborbitary foramen is by no means large; the proportion of diploe in the upper part of the cranium bears no comparison with that in the existing elephant, these differences combined with the peculiarity of form and position of the external nasal aperture, may, in all probability, modify the extent to which this variety of Mastodon was provided with trunk; but to forbear from surmises or speculations in the present imperfect state of the inquiry, it will be sufficient to place this as a second to the *angustidens* formerly noted.

P. S.—A letter this moment received from Captain Cautley announces the discovery of a superb specimen of the *Mastodon angustidens*, a skull with both lines of molars, palate, and one orbit entire: he adds—"We have much still to learn of these *Mastodons;* with regard to the *Mastodon elephantoides* of Clift, there are evidently two species, of the same character as to dentition, but with a remarkable difference in the form of cranium, one of which has the flat and the other the elevated crown." A very perfect head of a horse has also just been extracted by the *Sewalik* working parties, from the hard sandstone.—Ed.

III.—*Additions to the Ornithology of Népal. By* B. H. Hodgson, *Esq.*

1. *Indication of a new Genus of Insessorial Birds.*

Conirostres, *Sturnidæ, Lamprotorninæ ?* Dentirostres, *Merulidæ, Crateropodinæ ?*

In the suite of specimens of Nipalese birds forwarded by me, three years ago, to the Zoological Society of London, were three or four of the subject of the present article. They were marked in the imperfect list obligingly returned to me as "a new form nearly allied to *Pastor*." But, if *Pastor roseus* be the type of that genus, I confess I cannot perceive much affinity with our bird, either in structure or in manners. And, if a strong, arched, solid and compressed bill, united with gradated wings, and very strong feet, be *the* marks of the *Crateropodinæ*, to that sub-family, I conceive that our bird should be referred; the more especially as its shy and retiring habits are alien to those of the whole *Corvidæ*, and in a yet more particular manner, to those of the Sturnine branch of it. The Indian *Stares* seem to have perplexed systematists most wofully, though, I fancy, there is not one of us exiles 'in the land of the sun,' but readily

recognises the propriety of the *native* genus *Maina*. All the *Mainas** have a preponderant similitude of general structure and of habits, constituting generic unity, if such a thing there be; and placing these birds, in a natural system, close to the European genus *Sturnus* (secundum Linnæum); unless indeed that single genus should not rather embrace the whole of the *Mainas* sub-generically. Yet, according to the latest and most accredited systems, these birds are scattered at random amongst the *Lamprotorninæ*, the *Pastorinæ* and the *Coracianæ*, constituting the Sturnine genera *Dilophus*, *Acridotheres*, and *Pastor*, and the *Corvine* genus *Gracula vel Eulabes!* Should we feel disposed to turn from English to French systems, the matter is no way mended: for Cuvier's *Dentirostral* and *Meruline Grakles* are sundered, toto cælo, from his *Conirostral* and *Corvine Stares;* and Temminck's *type* of the genus *Pastor* is dissevered widely from all its congeners! If the first men of the age can so err for want of local information†, it is to be hoped that some of them will, ere long, see the necessity of *methodical co-operation* with those who are capable of supplying that information, and who, I will add, are most anxious to supply it, upon fair and gentlemanly terms of participation.

* We have seven species, all abundant in Nipal.

1. Religiosa.
2. Cristelloides, (nob.)
3. Tristoïdes, (nob.)
4. Sylvestris, (nob.)
5. Affinis, (nob.)
6. Communis, (nob.)
7. Terricolor, (nob.)

Of these, 2 and 3 are very nearly allied to Cristatella and Tristis; 4 and 5 to Pagodorum and Malabarica. The 6th inclines much to Sturnus; and the 7th, a very osculant species, has very considerable resemblance in the form of its wings, tail and legs, to Cinclosoma.

† So subtile and various are the relations of birds to one another, that no success can attend the ambitious project of a *general* classification conformable to nature, unless, to the intimations derived from external structure be added those derivable from internal structure and from habits and manners.

But how shall the most able man of science at home procure an adequate supply of the latter sort of information, unless he will associate to himself some intelligent and persevering local students? Dried skins are but dried skins! And why have we Zoological Societies, unprovided with travelling naturalists, if not to accomplish *some sort* of adequate union between domestic skill and foreign opportunity?

So long as the closet and field departments continue separated, so long will the multiplication of idle names and vague species go on, whilst no effectual progress will be made in the noble attempt at a natural classification.

What adds to my difficulty in attempting to class the birds now in question is, that the so-called *Pastor Traillii* (very abundant in Nepal) is, in my judgment, a typical Oriole; whilst the *Lamprotornis spilopterus* (also common here) is not easily referable to Temminck's genus *Lamprotornis*.

Mr. Swainson, who has very recently revised the *Sturnidæ* of our modern English school, characterises the sub-typical or *Lamprotornine* group of them thus. "Bill more compressed and thrush-like, its base not angulated; the tip of the upper mandible distinctly notched." In the above characters I perceive some faint traces of our bird: but when I turn to the indication of the entire family, those traces seem obliterated, for "the conic straight bill, naked nostrils, and lengthened pointed wings," of the *Sturnidæ*, essentially *conflict* with the structure of our subject.

With these preliminary remarks I shall now attempt to characterise our bird, as the type of a new genus or sub-genus, either of the *Lamprotorninæ* or of the *Crateropodinæ*, as the learned shall please.

Cútia nobis. *Khutya* (quasi *Pedatus*) of the Nipalese.

Bill equal to the head, at base higher than broad, sub-arched and much compressed throughout; strong, entire*, obtuse. Culmen considerably carinated between the nares, but not much produced among the soft and simple frontal plumes. Tomiæ erect, rather obtuse, and near to the palate. Nares broad-lunate, sub-basal closed above by a nude un-arched scale. Rictus moderate, smooth. Orbits and head plumose. Wings short, but firm; 5th quill usually longest; 2 first strongly—2 next, slightly gradated up to it. Tail short, quadrate and firm. Tarsi sub-elevate, very strong, nearly smooth. Toes compressed and ambulatory; lateral fores unequal, connected basally, the outer one as far as the joint; central not elongated; hind very large, sub-depressed and exceeding either of the lateral fores. Nails, compressed, strong, moderately bent, rather blunt†.

* Entire in the majority of my full grown specimens, but in others there is a faint notch. This liability to vary perpetually occurs in Cinclus, in Cinclosoma, in Cuculus, and in Timalia (not to mention more); rendering the task of characterising *justly*, a work of time and labour in comparisons.

† So soon as the family and sub-family of our genus be determined, a great part of the above generic definition may be omitted relatively to such determination. At present the larger divisions sadly outrun the characters which should accompany and designate them. Vide Shaw's General Zoology, vols. 13 and 14, where few of the larger divisions have any characters attached to them. Vide also the Regne Animal, Aves, wherein the subdivisions are indicated, *passim*, by two or three vague words!

Type *Cútia Nipalensis*, nobis.

Nos. 254, 255, of the new specimens and drawings in the possession of the Zoological Society. In order to illustrate the affinities of our bird, I proceed to compare it with *Pastor roseus* and with *Lamprotornis spilopterus*.

In *Pastor roseus* (as in all the typical *Pastors* in my possession) the bill is longer than the head, straight, conico-cylindric, and soft and feeble towards the base. Its gape is angulated; and the plumes of the head, carried forwards to the anteal extremity of the oval nares, are pointed, glossed, and elongated. The ample and pointed wings, have the 1st quill bastard; the 2nd, very long and nearly equal to the 3rd, which is always the longest. The tarsi are strong, elevated and heavily scaled. The toes have the laterals and hind equal, and the central fore considerably elongated. The outer fore toe has a basal connexion with the central, but the inner is free.

In *Lamprotornis spilopterus* the wings have exactly the same form as in *Pastor roseus*; and, as this identical form is also found in *Eulabes religiosa*, (not to mention more typical *Pastors*,) it would seem to be characteristically and extensively significant*. The bill of *Lamp. spilopterus*, which is scarcely longer than the head, uniformly sub-arcuated and not angulated at the gape, *so far* agrees with our *Cútia*. But its base is distinctly depressed, whilst forward it has a very slight compression and sub-cylindric outline. It is, besides, *sharply* pointed, *saliently* notched, and its trenchant fine tomiæ are *deeply interlocked*. Carry these peculiarities a little further and you have the bill of *Chloropsis*, which genus further agrees with *Lamprotornis spilopterus* almost entirely in the nature of the food of

* The generic character of Pastor gives 'remex prima longissima:' but it is not so in my specimen of the type or *Roseus*: nor in any other typical *Pastor*, if Pastor be the equivalent for *Maina*. On the other hand, if *Acridotheres* be held to be that equivalent, the 'genæ plus minusve nudæ' is true of *Tristoïdes*, not true of *Cristelloides*, which two species are, however, as nearly allied as possible and perpetually associate together, every large flock of the former having many individuals of the latter. In other words, these genera are artificial and false; neither of them being capable of comprising consistently half a dozen of the most similar birds. The cheek piece *cannot* be an influential character, or one of the above named two species would not have it, and the other want it. By consequence, I should say, the genus *Eulabes* is purely artificial; for, bating the cheek piece, there is nothing left to distinguish the single species ranged under it, but a greater degree of thickness in a bill of exactly the same essential character.

Commend me to the *old* genus *Gracula*, sub-generically divided.

Our *Maina* is the prototype of the French *Martin* and of the English *Minor*.

the species, and in the structure of their stomachs. On the other hand, the harder, blunter, more solid, and uniformly compressed bill of *Cútia*, associated as it is with a subtriturating stomach and a diet consisting of hard insects and seeds, seems to affine our bird to *Pomatorhinus* and its allies.

In *Lamprotornis spilopterus* the nares are still short and round, though there be somewhat more approach to a nude membranous tect than in *Pastor roseus*.

In *Lamprotornis spilopterus* the tarsi are rather low, and the feet suited more to perching than to walking, the soles being flattish and the nails very acute. The lateral fores (of which the outer one only has a basal connexion) are shorter in proportion to the central, and longer in relation to the hind, than in our bird, which, by its longer legs, and full soled stout toes, provided with straighter and blunter nails, proclaims its more terrestrial habits, notwithstanding the basal connexion of the fore toes. Lastly, the pointed and burnished feathers upon the head of *Spilopterus* are wholly wanting in our bird.

In *Spilopterus* they seem to intimate relationship with the *Stares:* nor is the intimation unrequired; for the habits and essential structure of this species*, when viewed in relation to whatever hath been, or can be justly, alleged of the *Sturnidæ*, savour more of contrast than of similitude. As for our *Cútia*, amidst all its anomalies (so to speak) of external structure, there is certainly something *Sturnine* in its aspect; and, by the formation of its feet and wings, as well as by its variegated plumage, it bears some resemblance to *Sturnella;* a genus "leading directly to the true starlings."

Species new. *Nipalensis* nobis. *Nipalese Cútia*, nobis.

Habitat, central and northern regions: adheres to the wilds, and feeds on hard seeds and hard ground insects.

Colour and Size. Male. Above, brilliant rusty yellow, with jet black remiges and rectrices: cap, and a large apert central portion of the wings, slaty; the former, confined all round by a black band

* Quod est, structure of the chylopoetic viscera of the bill, and of the tongue, taken collectively.

In all these respects there is a strong tendency towards Ixos, Chloropsis, Hypsipetes, and others of the frugivorous arboreal and short-legged section of those most anomalous thrushes, the other or long-legged division of which seem to make some such approximation to the Conirostres, as the short-legged section does to the Tenuirostres. Cuvier's Philedones, of which our Sibia may be taken as a perfect type—appear to unite these two very opposite sections. Sibia Picaoides has the tail and feet of Pica; and the bill and tongue of Chloropsis! But these are mysteries for the amply stored Museum and Library to solve!

proceeding through the eyes and ears from the nares. Below, from chin to legs pure white, from legs inclusively to tail, flavescent: the flanks broadly cross-barred with black: a spot of the same hue at the base of the maxilla: most of the quills and the lateral rectrices, tipped with white: lining of the wings and quills internally towards their bases, albescent: bill above blackish, below plumbeous: legs orange yellow: iris brown, 7 inches long by 11 wide, and 2 oz. in weight: bill $\frac{14}{16}$: tarsus $1\frac{3}{16}$: central toe $\frac{12}{16}$: hind toe $\frac{10}{16}$. The female is a trifle less in size: her mantle is variegated by longitudinal black drops; and her cheek-band is brown instead of black.

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2. *Indication of a new Genus of Waders, belonging to the Charadriatic Family.*

Most Indian sportsmen are aware that there are two species of wader, known to the natives by the common name of *Carvának* or *Carbának;* one of which frequents dry sandy plains, and the other, sandy banks of rivers.

The former bird belongs to the genus *Œdicnemus* or *Thick-knee*, scarcely differing, as a variety, from the European type of that genus. But the latter, though possessing the same figure (even to the large head, with abrupt elevated forehead and great staring eye), as the other; and though, moreover, resembling the other strictly in the form of the legs, wings and tail, yet differs from it *totally* in the structure of the bill.

This member, which in *Œdicnemus* has very much of the *Plover* form, in the river-haunting *Carvának* exhibits the strength and size so conspicuous in the *Storks* and *Jabirus*.

I find no generic mention of such a form in the works of Ornithology accessible to me; and I therefore propose to characterise it as a new genus; subject to the correction of those whose access to libraries and museums qualifies them to lay down the law in matters of this sort.

Order Grallatores. Family Charadriadæ. Genus *Carvánaca*, nobis.

Character.

Bill twice as long as the head, sub-recurved, strong, convex above, considerably compressed; the base thickish and rounded; the tomiæ very trenchant, locked, and denticulated and notched towards the tip, as in *Ardea*. Nares broad-linear and placed forward in a wide membranous fosse, extending $\frac{1}{3}$ from the base to the tip of the culmen. Tongue long, narrow, fleshy: towards the point cartilaginous, and the point itself sub-bifid. Form of the head and body, of the feet, wings and tail, as in *Œdicnemus*.

Type *Carvánaca Grisea*, nobis. *Œdicnemus Magnirostris*, Hardwickii ?

Specific character.

Carvánac. Above, a sky grey: below, together with the frontal zone, white. Brows, ear-coverts and mustaches, blackish. Shoulders, false wing, and coverts next them, together with the quills and tip of the tail, blackish. Wings and tail irregularly but largely banded with white, and both white for the most part, below. Length of the bird 20 inches, width 36, weight 1¼ lbs.

The marks. This species inhabits the Bengal Presidency, very generally, being always found on the wide sandy banks of the larger rivers during the cold months of the year. It migrates to Tibet in summer, and passes over Népal on its way to and fro. Its food consists of crabs and other hard-shelled fish. Its intestines are from 22 to 25 inches long, with two cæca, each 3¼ inches, placed at 5 inches from the lower end of the gut. The stomach is a strong triturating gizzard, fitted with the aid of gravel, to grind the hard parts of the bird's food.

Manners cannot well be more dissimilar than those of the desert and ripuary *Carvánacs:* the former adhering to dry arid plains, very much like the Indian Bustards*; and the latter, as exclusively to the beds of rivers. Whoever will refer to the English Cuvier, (Aves. III. 307,) will perceive that our *species* is probably not unknown to science. Is it not the *Œdicnemus Magnirostris* of Hardwicke ?

At the place quoted, two other allied species are cited, and these three may constitute the new genus or sub-genus *Carvánaca*, distinguished from *Œdicnemus* by totally different manners, and by a truly cultirostral bill.

It were well, indeed, if all new genera rested on diversities so marked as these—the manners so admirably tallying with the structure of that grand instrument of sustentation, the rostrum. Our genus, moreover, appears to me to constitute a remarkable and distinct link of connexion between the *Ardeidæ*, by means of *Mycteria* and the *Charadriadæ* through *Œdicnemus*. And it would, in my judgment, be quite as consonant to nature to confound *Œdicnemus* with *Charadrius*, as *Carvánaca* (nobis) with *Œdicnemus*.

The only consequence of Hardwicke's species proving to be the same with ours, ought therefore to be—not the rejection of the new genus, but—the merging of my specific name of *Grisea* in his of *Magnirostris:* unless indeed, the latter term be not held to have lost

* It is frequently called by us the Bastard Florican.

its significance in relation to a genus as much distinguished for the strength and size of the bill, as any one of the *whole order*.

3.—*Indication of a new Genus of the Falconidæ.*

Falconinæ, Vigors. Genus new. *Báza*, nobis.

Generic character. Bill as in *Ierax*, but somewhat longer: upper mandible, with two sharp teeth on either side the hook, directed forwards: lower mandible with three or four smaller ones, on each side, correspondent to the former. Nares transverse, long, and linear, with the cere behind them membranous and free to base of bill. Legs and feet short and thick. Tarsi low, half plumed, coarsely reticulate. Toes short, cleft, inner fore and hind somewhat depressed and the latter large. Aeropodia wholly reticulate. Talons sub-equal, acute, squared below.

Wings long, equal to tail: 3rd quill longest.

Type. *Báza Syáma*, nobis.

In addition to the above significant particulars, (some of which may hereafter be omitted in the generic character,) I may add that the orbits, lore, and sides of the cere are clad in soft, composed plumage; that the cere is short and nude above; that the bill has great breadth and depth at the base, corresponding with the broad flat head and large eye of the true *Falcons*, and, both of which distinguish our bird no less; that the first and second quills are but moderately gradated*, and all three pretty sharply emarginated towards their tips, though not so near as in *Falco* or in *Ierax*; that the tail is of medial length and square; that the tongue is bifid; and that, lastly, the feeble feet are remarkable for the sub-equality of the toes and talons, the roughness and levelness of the soles, and the size and depression of the thumbs. The complex affinities of this singular genus are obviously with *Cymindis*, *Harpagus* and *Ierax*. It is more nearly allied to the last, and its position (in Vigors' arrangement of the *Falconidæ*) clearly is at the head of the *Falconinæ*, and leading from the genus *Gampsonix* to the genus *Ierax*. It differs from *Ierax* by its cymindian nares, its long wings, and its cleft toes, with unballed and depressed soles.

Species new. *Báza Syáma*, nobis.

Black, glossed with changeable blue or green: the belly and sides, rufous white, crossed by five or six broad bars of lake tinged ochreous red: outer web of the secondaries, the same hue—of the tertials,

* 1st is 1½ inches, and the 2nd ½ an inch, less the 3rd: the rest rapidly fall off; and the primaries exceed the tertiaries by nearly three inches. The scapulars are of good length.

white: scapulars and long coverts nearest them, whitened internally: a broad white gorget on the breast: remiges and rectrices plumbeous, for the most part, on the lower surface: legs and bill plumbeous: talons and tip of the bill, black: iris brown: a long slender drooping crest from the occiput: 13 inches long by 30 wide and 7 to 8 oz. in weight: bill, $\frac{14}{16}$: tarsus, $1\frac{6}{8}$: central toe, 1.

Remarks. These birds are peculiar to the great forests of the *lower region*, so far as I yet know. The sexes are alike both in size and colours: both in young and moulting birds the leaden colour of the legs is lost in fleshy grey—that of the bill, in dusky grey; and the powerful complex dentation of the bill, (both mandibles) is in the juniors only traceable as a festoon upon the upper mandible.

4.—*Indication of a new Genus of the Picidæ, with description of the type. A new species, also, of two new species of the Genus Sitta.*

Yunxinæ, Swainson. Genus new; *Sasia*, nobis. *Sasya* of Nipal.

Generic character.

Bill equal to the head, conico-compressed, pointed and entire: the base furnished with tufts of hair as in *Bucco*.

Nares round, basal, lateral, remote, and concealed. Tail short, soft and square; wings equal to the tail, full, soft, first quill sub-bastard, 5 and 6, longest and equal; tertials sub-equal to primaries.

Feet three-toed, hind toe stoutest, sub-equal in length to outer fore; inner fore connected to first joint. Nails somewhat straightened and obtuse.

Tongue as in *Picus*.

Type, *Sasia ochracea*, nobis.

Species new. *Ochracea*; *Ochreous* red *Sasia*.

Form. It has been described above. In further illustration of it we may, however, add that this singular bird has a close relationship with our *Vivia*, from which it differs by its rather longer and *perfectly un*angulated bill; by its shorter, even tail; by the *Bucco*-like tufts of its bill; and, above all, by its three-toed feet, the nails of which have hardly any of the scansorial falcation and acuteness. Its orbits are nude, and it has a transverse corneous opercule *before* the eye.

Colour and *Size.* Subochreous red, with greenish yellow cap and wings; a white streak from behind each eye; and jet black unmarked tail.

Wings, internally, dusky; on their lower surface towards the bases of the quills, as well as the lining of the wings, buff. Legs fleshy yellow: bill plumbeous with a dusky ridge: orbitar skin plumbeous: iris brown: size very minute, $3\frac{1}{2}$ inches by 7, and $\frac{1}{3}$ oz. in weight;

tarsus $\frac{10}{16}$: anteal outer toe $\frac{3}{16}$: its nail $\frac{5}{16}$: sexes alike: Habitat, forests of lower region.

Remarks. On a recent occasion I quoted *Vivia Nipalensis*, (nobis) as the smallest of the family*. The above singular bird is still smaller, and both by its extraordinary form, and by its diminutive size, confirms the assertion then hazarded, that the vast forests of Nipal yield to none in the world in the number and variety of the Woodpecker tribe.

Certhiadæ. Genus *Sitta* auctorum. Species new; *Corallina*, coral-billed *Sitta*, nobis.

Form, as in *Castaneoventris*†, but considerably smaller in size. Above, soft sub-cerulean blue, tinged with lilac on the cap: below, sordid greyish: chin white: forehead black: great quills and lateral rectrices, blackish; the latter, white-tipped: legs plumbeous grey: bill intense coral red; iris straw yellow: $4\frac{3}{4}$ inches long by $8\frac{1}{2}$ wide, and $\frac{1}{2}$ oz. in weight: sexes alike. Habitat, central and northern regions.

Species 2nd, *Nipalensis*, nobis.

Above, saturate blue, darker than in *Castaneoventris* and with a purplish tinge; below, rufescent deepening as you descend the body, and showing full rusty on the lower flanks, vent, and inferior tail coverts: from the nostrils through the eyes to the shoulders, a black band: quills and lateral tail feathers, blackish: a white spot at the base of the two central rectrices; and the lateral ones blanched towards their tips: legs fleshy grey: bill dusky blue, changing to fleshy grey towards the base: iris dark brown: sexes alike: size of the precedent, and habitat the same.

5.—*New species of Hirundinidæ.*

Cypselus. *Chætura.*

Species 1st. *Nudipes*, nobis.

Form and size. Bill typically cypseline with large vertical nares, wings exceedingly firm and long; 1st quill longest, more than two inches beyond the tail: tail shortish, quadrate, longer than the coverts, composed of ten very firm square-pointed feathers, the rigid straight shafts of which are produced into naked acute spines. Tarsi longer than any toe, nude, smooth. Toes longer and more unequal

* A mistake, I find: for *Picus Minutus* is but $3\frac{1}{2}$ inches long, or, precisely the size of our present subject.

† Also a Nipalese species: and these hills have therefore afforded three species to a genus previously limited to one—or, at most, two, if *Pectoralis* prove to be distinct.

than in *Cypselus*, with the hind one distinctly versatile. Talons strong and scansorial; $8\frac{1}{2}$ inches from tip of bill to tip of tail, and 20 inches between the wings. Weight $4\frac{1}{2}$ oz. Tarsus $\frac{11}{16}$, central toe $\frac{9}{16}$. Colour, head as far as the eyes and ears (inclusive), dorsal neck, sides, rump, upper tail coverts, wings and tail, dusky-black with a changeable blue or green gloss: chin, throat, and most part of the neck in front, confluently white: bottom of the neck, on the anteal surface, breast, and body below, sooty brown: vent, inferior tail-coverts, and a lateral stripe from the thighs, backwards to them, white, more or less picked out with blue glossed black: back and scapulars, whitey-brown: inner web of the last tertiaries, pure white: legs purpurescent dusky: bill black: iris dark-brown: sexes alike. The young want the blue or green gloss of maturity: the clear whitey-brown of the back and pure sooty brown of the belly are in them blended into an uniform dusky hue; and their throat is of a very sordid white.

Remark. This singular species, by the structure of its feet, opens a passage from *Hirundo* to *Cypselus*. Though variously allied to *Pelasgia, Acuta, Caudacuta, and Gigantea*, it exhibits, I believe, a distinct type of form—being certainly not a *Chætura* as defined by Stevens, nor a *Cypselus* of Illiger; far less a swallow. It climbs with great power aided equally by its talons and its tail. Its habitat is the northern region, whence it sometimes wanders into the mountains of the central, avoiding however the open and level country. I have set it down in my note book as the type of a new genus, called *Hirund-apus*.

Species 2nd. *Cypselus Nipalensis*, nobis.

Sooty black, glossed with green: chin, throat, and top of the neck in front, confluently white: a white bar across the rump: talons and bill, black: iris brown: nude part of toes, dusky-grey. Size small; $5\frac{1}{2}$ by $12\frac{1}{2}$ inches; and barely one oz. in weight: sexes alike: structure typical: tail, short and even.

Remark. This is the common Swift of the central region, where it remains all the year, building under thatched roofs, and against the beams of flat roofs. It lays two white eggs and breeds repeatedly.

Genus *Hirundo*. Species 1st. *Nipalensis*, nobis.

Cap, back, scapulars and wing-coverts, brilliant deep blue: quills, tail feathers, and the longer tail coverts above and below, dusky: a narrow frontal zone, cheeks, neck, and body below, as well as the rump and lesser tail coverts above, rusty; paler and striped with narrow lines of dusky hue on the whole abdominal surface: dorsal

neck, more or less blotched with blue; rump, immaculate: bill, black: iris, dull brown: legs, fleshy-grey: sexes exactly alike: structure typical: tail long and deeply forked: size of *H. Rustica.*

Remark. This is the common *Swallow* of the central region, a household creature remaining with us for seven or eight months of the year.

Species 2nd. *Rupicola,* nobis.

Earthy grey brown: below, from the chin to the vent (exclusively), rufescent white: legs fleshy grey: bill black: iris brown: sexes alike: larger than the last, $6\frac{1}{2}$ by $14\frac{1}{2}$ inches, and weight $1\frac{1}{2}$ oz.: structure typical: wings exceeding the short and subfurcate tail. Habitat, the central and northern regions: not migratory: adheres to the mountains, preferring rocky situations.

N. B. The remaining Hirundine birds of *Népal* are *Hirundo Rustica* and the Sand-Martin; both of which, but especially the latter, are common.

IV.—*Description of the Shell and Animal of Nematura, a new Genus of Mollusca, inhabiting situations subject to alternations of fresh and brackish water. By* W. H. Benson, *Esq. B. C. S.*

Animal.—Caput tentaculis duobus setaceis oculis posticè prope bases tentaculorum sessilibus; proboscide elongatâ, cylindraceâ, extensili.

Pes ovato-oblongus, medio ventricosus, posticè angustatus, acuminatus, processu brevi filiformi subito desinens; anticè expansus, medio profundè emarginatus; alâ utroque latere porrectâ latè angustatâ, acuminatâ.

Testâ ovatâ, ventricosâ, à latere compressâ, ultimo anfractu insuper aperturam angulato, deflexo. Aperturâ integrâ constrictâ, orbiculari, suprà vix angulatâ; peritremate acuto leviter intus incrassato. Operculo tenui in spiram planam convoluto.

The snout is capable of great extension, and the animal is able to lick the summit of the shell with its extremity, which is armed within the mouth with a pair of strong vertical jaws, each apparently consisting of two pieces: these are constantly in motion in a vertical direction. The centre of the foot has a rounded peltate appearance, occasioned by the adaptation of its form to that of the operculum, which is visible through the transparent foot when viewed on the under side. The singular short filiform process attached to the extremity of the foot appears to be the termination of a nerve or minute canal, which is seen extending directly up the centre of the foot until it is lost under the operculum. The excrement is voided from the right side of the animal.

The shell is compressed laterally in a direction parallel to the axis and to the plane of the aperture, as in *scarabus*, but the prominent edges are rounded, and the former lips do not leave a ridge or keel at each semi-turn as in that genus. The sudden deflexion of the last whorl above the aperture, and the consequent depression and constriction of the aperture is a singular feature in the shell, and, in conjunction with its compressed form, led to my pronouncing the species to be a type of a distinct genus before I became acquainted with the animal or the operculum.

The first specimens which I saw, were shewn to me by Mr. Cracroft, who found them destitute of inhabitant or operculum in the *Sunderbans* east of the *Jabuna* river. He was unable to state whether they were land or water shells. Their occurrence in the delta of the Ganges so near to *Calcutta*, spurred me to diligence in the search after the species, and, about a couple of months subsequently, I discovered it alive between high and low water mark in pools, and on wet mud recently left by the tide in the river *Hooghly*, immediately opposite to the Esplanade. Here they were accompanied by *Melania lirata** and *Melania pyramis**. Dr. Pearson subsequently found them in the mud deposited by the aqueduct which passes in front of the Town Hall. Here we found them accompanied by assiminia fasciata, and by small specimens of novaculina gangetica. I also took specimens attached to a floating bamboo in the Salt-water Lake in company with *Neritina depressa*.

Though found between high and low water mark like assiminia fasciata, nematura does not otherwise resemble it in its habits, as it never attempts to creep out of the water in which it is placed, but ascending to the surface swims with the foot reversed in the same manner as *lymnæa*, *planorbis*, *paludina*, and the smaller *melania* use to do.

I have named the species on which the genus is founded

Nematura† *Deltæ*. Testâ ovato-conicâ, à lateribus tumidâ, lutescente, ultimo anfractu ventricoso, majori omnibus obliquè minutè striatis; spirâ brevi; apice acuto; umbilico evanescente. Long. 0.25 poll.

* *Melania lirata*, described as species D, and *melania pyramis* as species B, in *Gleanings in Science*, vol. ii. p. 22. Species A of that paper, I have elsewhere more fully described as *M. variabilis*, and I have named species C *M. elegans*.

† Lamarck has a genus of insects named *Nemoura* from νῆμα filum and οὐρὰ canda; but as he neglected the rules of composition the appellation of the present genus, while it expresses a singular feature in the animal, will run no risk of being confounded with that of the eminent naturalist.

V.—*Note on the Genus Pterocyclos of Mr.* Benson *and Spiraculum of Mr.* Pearson. *By Dr.* William Bland.

On the 27th of May last, I was fortunate enough to fall in with a shell of this genus, on the islet of *Susson*, one of the *Boontin* group, opposite to the peak of *Queda*, and in sight of *Pulo-Pinang*. Although the general description of my specimen answers to those above-mentioned, yet in some particulars it differs from both. The mouth is circular, its upper half marked inside by a double slightly raised line, from whence the pterygoid process is sent off which overhangs and forms the sinus, but the inside edge of this process does not touch the penultimate whorl as in Mr. Benson's shell, and it certainly differs from those of Mr. Pearson. In the specimen of *Pulo-Susson*, the sinus is $\frac{1}{10}$ of an inch from the rings above-mentioned to the outside arch, and from this arch to the extremity of the wing which overhangs and forms the sinus is $\frac{3}{10}$ th of an inch; the wing in breadth is $\frac{6}{10}$ th, mouth thickened, which thickening is carried on to strengthen the wing on its upper part. Shell one inch in diameter, with dark orange zig-zag lines across the whorls, and a band of a darker colour running longitudinally on the centre of the last whorl. Animal recently dead, but in a state of decay, so that nothing could be made out of it.

As one drawing is worth many descriptions, I have cut a leaf out of my book, having two figures of the natural size of the shell in question, No. 1, for your inspection; and, to assist in elucidating the history of this genus of beautiful shells, I have added another figure, No. 2, found at *Trincomalee*.

This shell has a small pterygoid process bending down, and in contact with the penultimate whorl, extending $\frac{1}{8}$th of an inch in front of the circular mouth, but no vestige of tube or sinus obtains in this specimen; lip thickened and reflected; the shell having all the appearance of maturity; diameter $\frac{7}{10}$ th of an inch; operculum convex, horny-formed, of circular layers.

Note on Dr. Bland's *Paper.*

The *Susson* species appears, from the drawing forwarded with the description, to belong to the typical group of *Pterocyclos*, which includes *P. parvus* and *rupestris*, and to be intermediate between the latter species and *hispidus*, to the last of which it exhibits an approach in the irregular aperture and dilated and thickened wing; but in the absence of a specimen for comparison, no specific character can be assigned with safety.

The *Trincomalee* shell is interesting as an arborant form, indicating the passage to *Cyclostoma*, which it approaches through the alate species, *C. petiocrianum* of Gray. It appears to possess the convex *operculum* composed of spirally concentric and exserted laminæ which characterizes the typical species of *pterocyclos*. This character seems to be gradually developed in the opercula of the *Cyclostomadæ* as the umbilicus widens, and the shell becomes more discoid; varying from the flat opercului of *C. elegans* through that of *C. involvulus*, where the edges of the laminæ are partially disengaged, and that of *C. teristriatum*, which is thickened and shews a strong spiral keel, to the convex and spirally laminar structure of the *pterocycloid* group.

The species of *Cyclostoma* from *Neemuch*, described by Lieutenant Hutton as No. 26, in page 520, vol. iii. J. A. S. I have ascertained by a comparison of specimens to be *C. semistriatum* of Sowerby, whose examples were procured from *Poona*.

Query. May not the impression of a supposed species of *Cirrus* noticed in Dr. Ward's paper on the geology of the Elephant Rock in the *Queda* country, printed in the second part Trans. Phys. Class, p. 166, be that of one of Dr. Bland's species of *Pterocyclos* from *Pulo-Sussoon?* A reference to the specimen No. 4 will decide.

VI.—*Note on the Nautical Instruments of the Arabs. By* James Prinsep, *Sec.*

Since the arrival of the Arab vessels which annually frequent the port of *Calcutta*, I have made diligent inquiries concerning the instrument in use among them for the measurement of the latitude, in hopes of elucidating thereby the Baron Von Hammer's translation of the "*Mohit*" (see p. 442). I have been hitherto unsuccessful, the English quadrant or sextant having generally superseded the more ancient and clumsy apparatus. One *Muallim*, however, seemed to recognize the instrument perfectly by my description, though he could not explain its construction; and promised to bring me one on his next voyage:—he stretched out his arms, when I inquired about the *issabah* division, and placing his fingers together horizontally, counted with them the height of the polar star, just as I guessed must have been the early and rude method of the Arab navigators.

At length in a vessel from the *Maldive* islands I met with an intelligent navigator who brought me the primitive instruments with which he was accustomed to work his way to *Calcutta*,—and as I do not think they are generally known, while it is certain they are of Arabic origin, I hasten to describe them as lithographed in Plate XLVIII.

Arabic Nautical Instruments

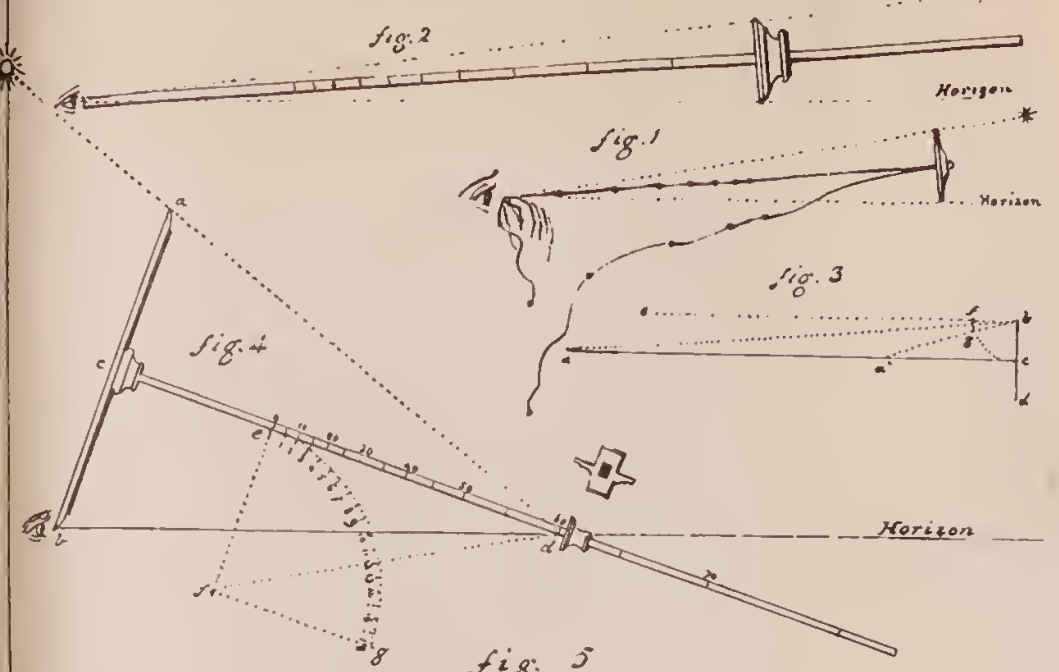


fig. 5

Fig. 1. is the كمال *kamál*, an instrument for taking the altitude of the polar and circumpolar stars*, in its most elementary shape.

It consists of a small parallelogram of horn (about two inches by one) with a string (or a couple of strings, in some instances), inserted in the centre. On the string are nine knots. To use the instrument for taking the height of *polaris*, the string is held between the teeth, with the horn at such a distance from the eye, that while the lower edge seems to touch the oceanic horizon, the upper edge just meets the star: the division or knot is then read off as the required latitude.

The mode of marking off these knots is curious. Five times the length of the horn is first taken, as unity, and divided into twelve parts: then at the distance of six of these parts from the horn, the first knot is made which is called "12." Again the unit is divided into eleven parts, and six of these being measured on the string from the horn as before, the second knot is tied and denominated "11." The unit is thus successively divided into 10, 9, 8, 7, and 6 parts, when the knot tied will of course exactly meet the original point of five diameters: this point is numbered "6." Beyond it one diameter of the horn is laid off for the "5" division, and one and a half again beyond that for the "4" division, which usually terminates the scale.

It is easy to determine by calculation the value of these several divisions, measured from the centre of the horn or diameter *b d*, and at right angles to it. They represent the tangents of the angle *c b a*, to radius *b c*, or cotangents to the complementary angle *e b a*: but *e b a* is equal to *b a c*, which is half of *d a b*, therefore the divisions represent cotangents of half the angle of observation. To judge then of their actual value, expressed in altitude, we have but to convert their numerical ratio to radius, by a table of natural cotangents, into degrees and minutes; and to take the double as the latitude in each case: thus, the horn being equal to double radius *b c*, we have

						Cotng. of half angle.	Lat.	Diff.
The first division, No.	12	= 2 × 5	÷	12 × 6	=	5.00	22°38′	
	11	10	÷	11 × 6		5.45	20 46	1° 52′
	10	10	÷	10 × 6		6.00	18 54	1 52
	9	10	÷	9 × 6		6.66	17 4	1 50
	8	10	÷	8 × 6		7.50	15 12	1 53
	7	10	÷	7 × 6		8.57	13 18	1 53
	6	10	÷	6 × 6		10.00	11 24	1 54
	5	10	÷	2		12.00	9 32	1 52
	4	10	÷	5		15.00	7 36	1 56

It will be seen by the last column that the harmonic progression of the divisions obtained by this simple rule, agrees very closely with

* The man assured me it was for taking the longitude, and promised to come one night and use it in my presence, but failed.

equable increments of the angle of elevation, falling somewhat short of two degrees for each division. Further the highest number, 12, gives nearly the latitude of *Calcutta*, or 22° 38′, the most northerly latitude for which the *Maldive* navigators have any occasion; while the lowest mark, 4, gives the latitude (nearly) of the southern point of *Ceylon*, or the average of the *Maldive* islands.

It is a circumstance worth noting, that if the unit had been assumed at 6 diameters instead of 5, there would have been obtained a series of divisions almost identical with the *issabah* of 1° 36′ used by the navigators of the fifteenth century* according to the *Mohit*. The series may also be extended both ways without very much deviating from the same progression: thus, commencing with

				Lat.	Diff.
12 × 6 ÷	16 =	4.50	Cotang. of half angle.	25°04′	
	15	4.80		23 32	1° 32′
	14	5.14		22 01	1 31
	13	5.54		20 28	1 33
	12	6.00		18 56	1 32
	11	6.54		17 24	1 34
	10	7.20		15 48	1 34
	9	8.00		14 14	1 34
	8	9.00		12 40	1 34
	7	10.29		11 06	1 34
	6	12.00		9 32	1 34
	5	14.40		7 56	1 36
	4	18.00		6 22	1 34
	3	24.00		4 46	1 36
	2	36.00		3 10	1 36
	1	72.00		1 36	1 34
	0	infinite		0	1 36

In this manner a string, or a staff, may be marked off into tangential divisions, equivalent to the *issabah*, from *zero* or sixteen *issabah*, or up to an altitude of 25 degrees, within a limit of error by no means appreciable to the Arab *nakhoda*, and hardly of consequence to the refined navigator of modern times. Whether the practical rule thus developed was or was not resorted to, it is very plain that it might have been so adapted; and all the latitudes in Sidi's work might have been worked thereby; and the lower series of divisions might be nothing more than the same divisions numbered inversely on the lower side of the square staff, as will presently be noticed.

Fig. 2, the *bilisty*† is an evident improvement upon the original cord; a square rod of ebony being substituted for the stretching cord, and the radius being made to slide thereon at right angles. There is economy of space also,—the four sides of the wooden rod admitting of four series of divisions, adapted to four sliders of different sizes, so as to increase the scale without lengthening the rod inconveniently. Still the string

* See page 445. † بلستي

has the advantage in point of portability. The rules for dividing the wooden bar are the same as for the string, but the marks must be laid off invertedly, beginning at the eye end, which is in this the fixed point.

Fig. 3 is an instrument still used by the Arabs for taking the sun's altitude. It is exactly the same in principle as the above, but to obviate the inconvenience of looking at the sun, the eye is directed to the opposite point of the horizon, from the lower end of the cross bar, while it brings the solar shadow of the upper end of the same to meet the horizon by adjusting the slider *d* to or fro on the divided arm. The mode of dividing this arm, as performed in my presence by the *muallim*, or pilot, is represented in the plate; but it is obviously incorrect. A space *c e* is laid off equal to radius *a c;* from *e* a perpendicular *e f* is raised, and with the same radius a quadrant *e g* is drawn, which is divided into eighteen equal portions (of five degrees each); through these points are drawn radii to meet the tangential line; and the subdivision into simple degrees, and sixths, is either done by the eye, or by a continuation of the same rule. It will be seen on inspection of the figure, that as the angle *g f d* is equal to the sum of the angles *f d b* and *b d e*, while *b d e* is equal to *half* the angle of observation, angle *g f d* can only be equal to angle of observation when *f d b* and *b d c* are equal, and that the 90° point is therefore the only true one on the scale of divisions. The true mode of division is, as in the case of the string, to describe a quadrant from centre *b*, and to draw radii through each semi-degree of the arc from 45° downward, because the angle of observation *a d b* is, as before, equal to twice the angle *f b d*, of which *c d* (*c* 0, *c* 10, *c* 20, *c* 30, &c.) are respectively cotangents.

To ascertain whether the fault lay with my Arab informant, or with the instrument, I compared the actual divisions on the latter with a scale of cotangents, and found the following results, calling the radius *a c* = 1.00.

Angle of altitude.	Angle marked.	Length *c d* or cot. ½ angle.	True angle deduced.	Error of division.	Error if false mode had been used.
90°	0°	1.000	90° ′	0°	0° ′
85	5	1.096	84 46	—0 14	—0 30
80	10	1.196	79 48	—0 12	
75	15	1.308	74 46	—0 14	
70	20	1 435	69 44	—0 16	—3 30
65	25	1.557	65 26	+0 26	
60	30	1.719	60 22	+0 22	
55	35	1.911	55 14	+0 14	—7 27
50	40	2.142	50 04	+0 4	
45	45	2.418	45 0	0	
40	50	2.759	39 50	—0 10	—10 23

It is evident from this comparison, that the instrument was divided on correct principles, and that the *muallim* had ventured upon an explana-

tion without duly qualifying himself by consulting his books. It is also clear that the same set of divisions may be made to serve for night observations by placing the eye at *d*: but as they only embrace altitudes exceeding 40 degrees, the instrument would not be applicable to the polar star in equatorial latitudes.

In conversing with the same *muallim* on the track taken in different monsoons, I remarked that he always talked of sailing upon different stars, in lieu of different points of the compass, as we should express ourselves. It immediately occurred to me, that this might explain some of the obscurities of the *Mohit*, where, for instance, that work directs the polar altitude to be found $7\frac{1}{2}$ inches at the "setting of *Aquila*;" it might mean that the ship should steer upon the setting point of *Aquila*, until the pole should be depressed or raised to the altitude indicated.

I endeavoured therefore to procure an Arabic compass, but not one could be met with in all the vessels—at length my friend Syed Hosein Sidi found a drawing of it in one of the practical works on navigation, (the *mājid kitāb**) in possession of a *nakhoda*, and without ceremony tore out the leaf to shew it to me, as the captain was afraid of parting with the volume, without which doubtless he would have been greatly at a loss on his return voyage. I immediately made a lithograph drawing of it (fig. 5) exactly as I found it, with the circle of English numbers, shewing it to have been copied from a European card, around which the names by which the Arabs "box the compass," had been entered as more conformable to their own practice.

These names would seem to point to a time anterior to the invention of the magnetic compass, when indeed the only way of ascertaining the relative position of a ship at night in the broad ocean was by observing the points of the horizon where prominent stars rose and set. The system could only have been adapted to intertropical navigation, wherein no very great variation occurs in these azimuths, and it is necessarily but an approximation to truth, as hardly any of the prominent stars selected rise or set at the precise azimuth named from them. By the positions assigned to some of the southern stars, we must suppose that it was framed rather to suit places northward of the equator; but in drawing out the following comparative view, I have thought it preferable to enter the azimuth of each star on an equatorial projection, when of course the azimuth is equal to the polar distance, and the compass card thus affords to the Arab *nakhoda* a rude

* ماجد كتاب or, as my Maldive friend facetiously expressed it, the "*John Hamilton kitāb*" of the Arabs. It would be a work of great utility to print an edition of this volume, with emendations and additions suited to the people, who depend upon it as we do on our Greenwich Ephemeris!

table of N. P. D. by which he may, if he please, take his latitude, with the simple instruments above described.

The card may be divided into two great portions, the eastern and western, in which the same names of stars occur in a direct and inverse order—on the east with the prefix مطلع *mutalá*, or "rising place of;" on the west with that of مغيب *maghíb*, "setting place of:" the north-eastern quarter has written on its circumference,

من الجاه طرف المطلع مطلعي شمالي العرض زايد والطول زايد

"From the *north* towards the *east*, *Mutalál Shimáli*,—(the *north-eastern* quarter,)—latitude increasing, longitude increasing."

The south-eastern in like manner has the words:

من المطلع طرف القطب العرض قاصر والطول زايد مطلعي جنوبي

"From the *east* towards the *south*, *Mutalái Janúbi*, (or the *south-eastern* quarter,) the latitude diminishes, longitude increases."

The north-western:

من المغيب طرف الجاه مغيبي شمالي العرض زايد والطول قاصر

"From the *west* to the *north*, the *north-western* quarter, *Maghibi Shimáli*, latitude increasing, longitude decreasing."

The south-western:

من القطب طرف المغيب لمغيبي جنوبي الطول قاصر و العرض قاصر
على هزالجناب اذاكنت شمالي الخط *

"From the *south* towards the *west*, *Maghibi Janúbi*, the *south-western* quarter; longitude decreases and latitude decreases;—when you are to the north of the line."

The final words, *when you are to the north of the line*, apply equally to the remarks on all four quadrants; for example, when you sail on any point of the compass between north and west, you increase your latitude and longitude—and so forth.

The north point, or pole, is called, as in Sidí Alí's work جاه *jáh*, a word not to be found with this acceptation in our dictionaries; nor is قطب *qutb*, generally confined to the south pole, but rather the contrary. مطلع *matlá*, the rising place, and مغيب *maghíb*, the setting place (to wit, of the sun) are the terms used for the east and west cardinal points. It will be sufficient to enumerate one series of the intermediate *stars* in the order of their occurrence on the card.

1. N. by W. 11° 15'. مغيب فرقد, the setting point of *farqad*, the calf; one of the two stars known by the name of *farqadain*, (β et γ ursæ minoris.) η approaches nearest to the required north polar distance.

2. N. N. W. 22° 30′. مغيب نعش, the setting of *nâsh*, the bier. This constellation comprises the four stars of the belly, both of the small and the great bear, but generally and in the present instance, the name applies to the latter, of which, however, the position is nearer 30 degrees than 22½ in azimuth.

3. N. by N. 30° 45′. مغيب ناقه, the setting of *náqeh*, the she-camel, probably the same as العناق, the goat, of Dr. Dorn's celestial globe, the middle star of the tail of the great bear, *N. P. D.* 34°.

4. N. W. 45° 0. مغيب عيوق, the setting of *áyúq*, the kitten, αιουκ of the Greeks, or capella; whose north polar distance is in fact 44¼ degrees.

5. N. W. by W. 56° 15′. مغيب واقع, the setting of *wáqá*, the vulture, *wega* of our astronomy or α lyræ, *N. P. D.* 51½ degrees. This is the star translated by the Baron Hammer as *Aquila*; but the azimuth shews it to be Lyra.

6. W. N. W. 67° 30′. مطلع سماك, the setting of *simak*, contracted for سماك الرامح *simák ul rámá*, the spear-bearer, Arcturus, *N. P. D.* 70°. It is *Ascimech aremeah* of the Alphonsine tables.

7. W. by N. 78° 45′. مطلع الثريا, the setting of *surayá*, the Pleiades. The north polar distance of these stars differs so much from the azimuth here assigned, (being only 67°,) that the name is possibly applied to Aldebaran, (*N. P. D.* 73° 50′) although the latter is the true Arabic denomination of α Tauri.

8. W. 90°. مغيب, the setting place (of the sun), nearly constant in the equatorial regions.

9. W. by S. 101° 15′. مغيب الجوزا, the setting of *jozá*, a contraction for رجل الجوزا the giant's foot, known to Europeans as Rigel in the right foot of Orion, *N. P. D.* 98.24.

10. W. S. W. 112° 30′. مغيب النير, the setting of *tír*. I do not find any star of this name on the celestial globe described by Dr. Dorn in the Roy. As. Soc. Trans., nor is the word Arabic. The similarity of sound and near coincidence of azimuth might incline me to consider it as Antares, (115° 40′,) were it possible that the word نير *nír*, bright, in the passage quoted by Dorn from Ebn Muhammed, could be changed to تير the name of the star before us: the passage is as follows:

وصورة العقرب معلوم الاكثر معروف ويكون عند مغرز ذنب كوكب نير احمر من القدر الثاني هو قلب العقرب من منازل القمر*

"The constellation of the scorpion is known to every one: on the buttock there is a bright reddish star of the second magnitude,

which is the scorpion's heart." If the Arabic name of this star be *qalb ul áqrab*, whence was our name of Antares derived?

The only other resembling *tír* in sound is الطاير marked as *Atair* on our globes, and comprehending the three bright stars of *Aquila*; but the position of this constellation puts it out of the question.

11. S. W. by W. 123° 45′. مغيب اكليل, the setting of *Akleil*, the crown. There are several constellations so named. *Corona borealis* is called الفكة, and is much too far north. There is another *akleil* (*janúbí*) the southern crown, situated about azim. 120° which is nearer the mark: but the constellation intended may possibly be الاكليل العقرب, the crown of the scorpion, the 17th lunar mansion of Ulugh Beg; notwithstanding its error of azimuth. In position, the bright star Fomalhaut (فم الحوت) of Pisces Australis comes much nearer the mark, (121°) and it seems curious that it should have been set aside for a less conspicuous group.

12. S. W. 135°. مغيب عقرب, the setting of *áqrab*, the Scorpion. We shall see presently that *antares* is the star of this constellation here intended, although it is far too northerly for the position. But for such confirmation we might have suspected *áqrab* to be a corruption of الغراب *alghoráb*: the crow (κοραξ) which lies in 134° azimuth.

13. S. W. by S. 146° 15′. مغيب حماريين, the setting of *Hamárein* the two asses. This name is not to be found in the globe. The nearest to it in situation are α and β Gruis.

14. S. S. W. 157° 30′. مغيب سهيل, the setting of *Soheil*, the well-known star Canopus in the constellation Argo, *Alsafinah* of the Arabs. The north polar distance of this star, however, is only 143½ in lieu of 157½. It would set in azimuth 157½ at a place situated in north latitude 28°; so that if this be taken as a clue, we may trace the origin of the compass scheme to *Lower Egypt* or *Syria*.

15. S. by W. 168° 45. مغيب سلبار, the setting of *salibár*. As we proceed southwards it becomes more and more difficult to find the stars intended. Canopus indeed is almost the only one familiar to us. *Salibár* is not to be found on the globe, nor in the dictionaries: but it is the very word translated *Lyra* by the Baron Hammer, a northern constellation, which would be quite inadmissible in the southernmost situation of the compass. There is a constellation somewhat similar in sound on the brass globe described by Dr. Dorn, called السبع *Alsabá*, the beast, lying close to the Centaur with which its stars are mixed.—Again, should α Centauri be the star intended, it would be about the right distance in azimuth from Canopus—but this star is called

with its fellow in the other leg of the Centaur, حضار والوزن *Hazár-o-ulwazn* on the globe. The only other star of note falling within moderate limit of distance is α Eridani, or *Achernar* of our globe, which is a corruption of اخرالنهر *akhir-ulnehr*, 'the end of the river.'—Whatever star may be meant by *salibár*, it is surely more southerly than Canopus, and by no means Lyra. The two or three translated passages from the *Mohit* equally confirm this, and receive illustration from it. In the voyage to *Gujerát* (page 456) the translation says—"In this measure (the *kiás*, or lat. 16° 54′ north) Lyra *(salibár)* is five inches (13° 30′), or Sagitta (*sahm awal*) six inches (15° 6′), or Canopus and Lyra are equal to three inches and a half (11° 6′)." The second paragraph in page 457 is expressed almost in the same words. Now if for السهم *ul sahm* be read النهر *ul nahr* (α Eridani), and for *salibár* we take η Argonavis, the above conditions may very nearly be complied with; for, in north latitude 17°, Canopus and η Argo will be seen at an altitude of 12° together, on opposite sides of the south pole at the hour of 10 p. m. in the beginning of March. The north polar distance of α Centauri (150°) would better suit the given meridional elevation (13° 30′) than that of Argonavis: but in this case it must be *alnahr* and not *salibár* which must be coupled with Canopus at the equal altitude 11° 6′: and the text would need a second alteration.

Again, in page 456 (the latitude by position being about 18°) the translation says—"If it be not time for taking the polar star, take the height at the setting of Aquila (*nasr-wáqá*) by the Lyra (*salibár*) which gives 7½ inches (or 17° 30′)." Now first correcting *vega*, which we know to be α Lyræ, and not *Aquila*, we shall find that at his setting, the star above pointed out as *akhir-ulnehr*, Achernar, comes to the southern meridian, and bears very nearly the altitude required.

Here then *salibár* would seem to be α Eridani, whereas in the other two cases it may be η Argo. Until we get somebody to point out the actual star in the heavens, it will be impossible to decide between the two; but a considerable step towards the solution of the *Mohit* problem has, at any rate, been made by the discovery that *salibár* belongs to the southern hemisphere.

If the Baron will favor us with a translation of the first chapter which treats of the names of the stars, the division of the circle of the skies, and, above all, of the cardinal points of the compass, we shall doubtless be able to clear up all these points in a satisfactory manner.

The navigators of the Maldive islands follow the Arabs in their division of the compass which they call *samaqá* اسمقا a name apparently

taken from the *Malabar* word, *samoukká*, for which M. KLAPROTH is at a loss to discover the origin*, though it seems obviously a corruption of the Sanscrit term चुम्बक *chumbaka*, the loadstone. The Maldivís alter a few of the names, particularly towards the south. Some of these variations serve to throw light upon the doubtful parts of the Arabic list. The orthography also, as written in my presence by my intelligent friend MUHAMMAD, better known among his island countrymen as *Ustád-muallim*, the master-pilot, differs considerably, being more of the Malay style: one letter an ع with a dot under it, is, he tells me, peculiar to his islands: it has the pronunciation of *gh*, not of غ, while ق is pronounced more like *g*. The following is his catalogue:

عو pronounced *ghao*, the north pole—of unknown derivation.

فرغديم *farghadèm*, a corruption of *farkadain*.

ناس *násh*, the *alif* substituted for *ain*.

ايوق *áyouk*, ditto.

قاسل *gásil*, used for α Lyræ in lieu of *wáqá* or Wega.

سماق *simág*, the ق used for ك.

تريان *therián*, a corruption from *suraya*.

مرع *murgh*, the west—derivation unknown, perhaps corrupted from *maghib*,—*irua* is the east.

جوزا *jozá*, the star Rigel.

تير *tír*. Can this be Sirius, which is the next conspicuous star more southerly than *Rigel?* Its Arabic name is الشعري.

اقرب *agrab*, in lieu of *akleil*, shewing that the crown intended is the *akleil ul áqrab* of the globe, which consists, according to ULUGH BEG, of β, δ, η and γ of Scorpio; β has a N. P. D. of 112° only, which would give an azimuth of 115° in latitude 28° north.

قلب *galb*. If this be correct in orthography, it would denote قلب العقرب *galb ul áqrab*, the scorpion's heart, or Antares: but if intended for كلب the dog, it may stand for Sirius. The former is, however, most probable, because it confirms the Arabic name for the same point which is عقرب, or simply the scorpion, of which the principal star is Antares.

حماريم *hamárím*, the final *m* substituted for *n*.

سل *sil*, pronounced *silli*, an unknown substitute for *soheil*, which will be seen to be removed further south; perhaps it is the local name of Canopus, corrupted from the Arabic.

* KLAPROTH sur l'invention de la boussole, p. 32.

سلواء *siliwár*, the *w* substituted for *b*.

سهيل *soheil*, Canopus, is used by the Maldive sailors as the south cardinal point,—for what reason I was unable to discover. They also use the Indian word *dakhan*.

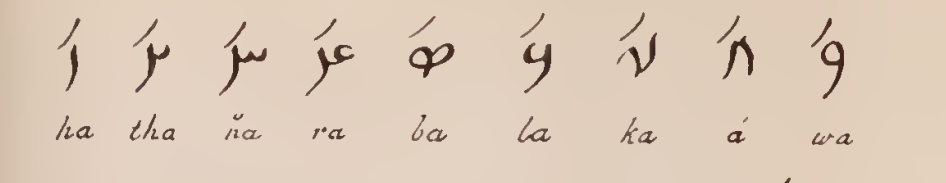
Note on the Maldive Alphabet.

While conversing with the *Ustád-muallim* one day on the above subject, I got him to write down the names as seen above in the Arabic character: being curious, however, about the modification of the ع *ain* introduced, I inquired whether the Maldive population had any distinct alphabet of their own, to which he replied in the affirmative, and gave it me in writing just as I have lithographed it in Plate XLIX—a most whimsical system, and calculated to puzzle antiquarians egregiously should they chance to stumble upon an inscription in the Maldives without possessing the key to it!

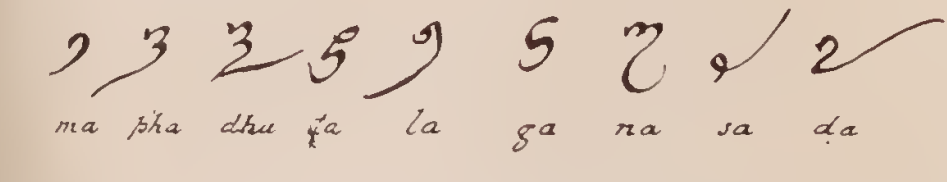
At first he told me they had but nine letters, (the second row in the plate,) *m*, *ph*, *d*, *t*, *l*, *g*, *n*, *s*, *d*; but on my observing that he made use of a letter not in this list for the *k* of *Calcutta*, he said—"Oh yes, there are the other nine" (the upper row)—meaning, as I presumed, that they were not indigenous but extraneous signs introduced to express foreign sounds: they are, in fact, the nine Arabic numerals with a dash above them to distinguish them from the ciphers. He wrote with greater fluency in these his native characters than in the Arabic.

The system of vowel marks is partly an imitation of the Arabic and partly of the Indian method; the long vowels being denoted by doubling the diacritical stroke: the nasal *n* is marked like the Sanscrit *anuswara*, but the letter م is also inserted. It was striking to observe how readily his ear distinguished the sound of a diphthong, and how correctly he expressed it with a double character. The order of writing is from left to right, contrary to the Arabic mode, and none of the letters admit of being joined together or abbreviated; but I pretend to no more knowledge of the alphabet, or language, than is comprehended in the plate itself, and need not, therefore, attempt to expand the materials of a short interview between two parties but imperfectly understanding one another, into a treatise on the unknown and, perchance, non-existent literature of these simple islanders.—It will, doubtless, surprise many that they should have arrived at all at the possession of an alphabet of their own. Among the specimens in the plate I have introduced the names of the cardinal points as given above.

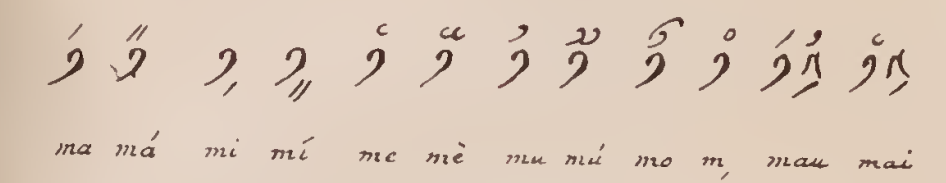
Maldive Alphabet



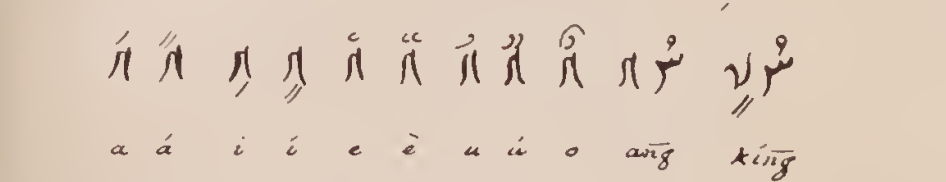
ha tha ña ra ba la ka á wa



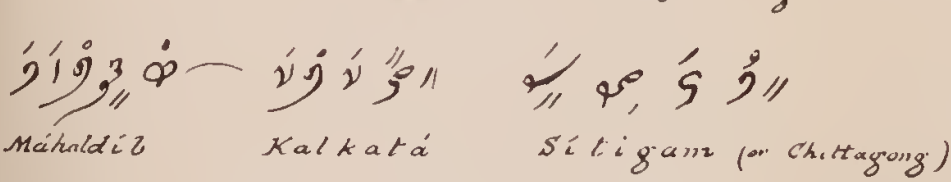
ma pha dhu ṭa la ga na sa ḍa



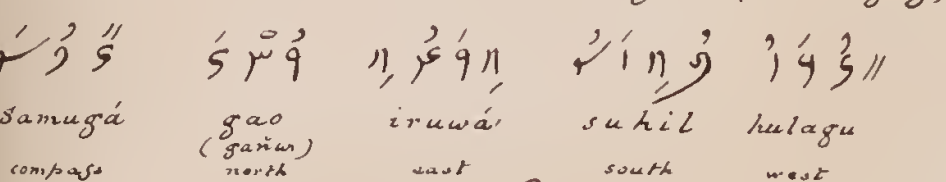
ma má mi mí me mè mu mú mo m, mau mai



a á i í e è u ú o aṁg kíṁg

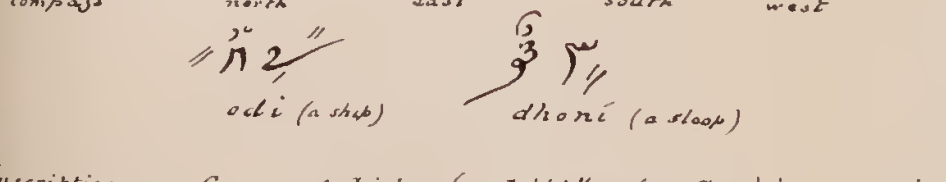


Málaldíb Kalkatá Sílígam (or Chittagong)



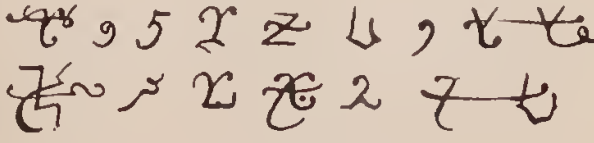
Samugá gao (gañw) north iruwá east suhil south hulagu west

compass



odi (a ship) dhoní (a sloop)

Inscription on a Cannon at Lisbon, (sent thither from Goa), in sanscrit letters.



Inscription on an ancient unfinished temple on a rock near Atgarh, in Cuttack.
by Sr Wm Jones

J Kingsbury lith.

Printed at the Oriental Lith. Press

VII.—*Facsimiles of Ancient Inscriptions, lithographed.*

(Continued from page 731.)

Inscription on a Cannon from Goa.

At the foot of Plate XLIX. I have inserted the copy of an inscription which, it seems has long puzzled the savans of *Lisbon*. Mr. J. Gaudart, chief interpreter and sworn translator to the British Government at Penang, Singapur, and Malacca, has addressed the Rev. Anselmo Yegros, Vicar General of the Singapur Mission, on the subject, affording, as he conceives, a full explanation of its purport; but either the characters must be exceedingly perverted in the copy, or Mr. Gaudart must have a powerful imagination, to convert, as he does, such hieroglyphics into the following Sanscrit sentence:

श्रीह भाण्ड उत्तम राज राम
स्वकीय १२ मेष ७२८

which he translates, "(cette) heureux (et) puissant manufacture appartient au bon Roi Rám le 12 de Bélier 728."

The rája here designated as the proprietor of the gun (if the reading be conceded) the translator explains to be *Ráma varma vira Martanda Perumal Tamuri*, who reigned at *Calicut* from the year 718, (A. D. 1542,) to 736 (A. D. 1561,) of the Parasuráma cycle. He was engaged in severe struggles with the Portuguese, and it is probable that the piece of ordnance thus fell into the hands of his enemies.

Of the letters themselves those only that bear resemblance to old Sanscrit, are the 1st, 3rd, and 4th. The rest appear purely conjectural.

Inscription at Kandharpur.

Lieutenant Kittoe, already well known to my readers for his antiquarian and architectural zeal, has, on his recent march with his regiment towards *Gumsur*, taken every opportunity of examining objects of antiquity in his route. The only inscription he has yet met with is shewn at the foot of Pl. XLIX. "It is (he writes from *Cuttack*) contained in two compartments of a very ancient and unfinished temple on a rock in an island near *Atgarh*; at a place called *Kandharpur* or *Kandalpur*." The characters are of the old Bengálí or Gaur type: and may be thus transcribed in modern Deva Nágarí; श्रीविचित्रश्वरदेवः श्रीविचित्र भूषण: "the divine lord of beauteous variety, the variegated ornament"—being the epithet, doubtless, given to the form of Siva, established or intended to be *sthápan'd* in the temple.

VIII.—*Description of* Uch-Shari'f. *By Munshí* Mohan Lál.

[Dated Sít Pun, on the joint streams of the Panjáb.]

Uch, surnamed *Uch-Sharíf*, or holy *Uch*, which being near the junction of the united streams Hesudrus, Hyphasis, and Hydraotes, Acesines, and Hydaspes, attracts the notice of geographers, contains numerous sepulchres of the Muhammadan saints. The oldest of all is that of Sháh Sáif ul Háqqárí, but it dwindles into obscurity. A miserable wall without the roof environs the dust of the above saint.

If I write the respective names of the saints of *Uch*, along with their incredible miracles, I fear to enlarge my remarks: however, I presume to lay before you the endeavors of my feeble pen in regard to Sháh Síad Jalál and his reputed descendants. He died 600 years ago, and is said to have lived to the age of 150. His tomb, which is inside a large but gloomy room, is elevated about five spans from the surface of the ground. It is a very simple building, adorned with the poor frail and old canopy. Both of his sides have ten graves of his offspring. They are distinguished by one rising above the other, which fill the entire position of the room. None of them have any kind of inscription.

Sháh Síad Jalál acquired a very great fame by defeating the Halássu', and converting his son Boláqu' into Islámism. He was the ruler of *Betúwahí*, near *Baháwalpur*.

Jalál had three sons, Ahmad Kabír, Bahá uddín, and Síad Muhammad. When the first of the three was about ten years old, he happened to meet a man in the bazár, whose son had died of some disease. He applied to Ahmad Kabír to restore his dead son to life. The young saint, after making ablution, turned his face towards *Mecca*, and repeated the words "Qum bi izn Alláh*," which literally means, Get up by the command of God.

Such is the wonderful miracle described of Ahmad Kabír. When he grew older, he became the father of the two reputed sons, Síad Jalál uddín and Síad Muhammad Ráju'. The former was called by the name of Makhdu'm Jahaníán Jahán Gasht, (or the traveller and the Lord of all beings;) and the latter, Ráju' Qattál, (or the Rájú slayer.) Numerous miracles were wrought by these two brothers. They went to pilgrimage through *Persia*, &c. &c. &c., marrying a great number of wives, and leaving children in every country, which, tradition says, amounted to 12,000; but I doubt the authenticity of the information.

* The power of raising the dead by saying the above mentioned word, I hitherto knew was only peculiar to Jesus Christ.

When the MAKHDU'M reached *Madínah* he was suspected to be a common Musalmán and not a Síad. On this he stood out of the door, and, looking at the tomb of MUHAMMAD, cried as follows: "*Assalám alaikiki yá jaddi*" (or, Peace be with you, O grandfather); when came the answer "*Va alaiki ussalám yá valdí,*" (or, Peace be with you, O son) out of MUHAMMAD's tomb, which convinced the men of the shrine that he was a real Síad. People assert that this proves his being the respected and first saint of the Musalmáns. On receiving the intelligence, I desired to visit the monument of such a renowned holy man of *Uch.*

In company with my countryman and school-fellow, Pandit KÁSHÍNÁTH, we proceeded to the town of *Uch,* and passed through a few narrow streets on our way to the shrine.

On coming to the door, which has dwindled into the most ruinous state, we descended towards the west, and turning to the south entered the room where the body of the MAKHDU'M rests. The tomb is a very poor structure, but raised about seven feet high from the ground, which is concealed by numerous other graves. There is nothing admirable in the shrine of the MAKHDU'M. Three small openings give light inside the apartment.

The following Persian inscription written on the door, presents us with the date of the MAKHDU'M's death.

تاریك گشت جمله جهان بیجمال شاه تاریخ بود هفتصد و هشتاد و پنج سال

"Tárìk gasht jumlah jahán be jamál Sháh,
Tárikh búd haft sad o hashtád o panj sál."

When the world was covered by darkness without the countenance of the Sháh, (or Makhdúm.) The date was 785 of the Hijrí era.

The mausoleum of MAKHDU'M JAHÁNÍÁN JAHÁN GASHT is annually visited by the pilgrims of the distant country. It is a popular belief in this region, that a fool can get restored to perfect sense by eating the earth of this tomb.

It is very odd that the tombs of the saints of the holy *Uch,* who possessed such boundless reputation and respect in days of old, have been not adorned with any kind of architectural beauty, either by their posterity or believers, except that of "Bíbí Jind Vadí," (or the lady of the long life.) It is situate on the verge of a precipice which commands the old bed of the *Panjáb* rivers, and gives a romantic view.

The southern part of this magnificent sepulchre has been unfortunately swept away by the late inundation of the above streams.

Besides this, it suffers a good deal by the neglect of the Musalmáns, who do not repair it. The door, which has been entirely eaten by worms, opens towards the east, and has a sight of the other two cupolas. They excel in material and handsomeness the others of *Uch*, except that of "Bíbí Jind Vadí."

"Bíbí Jind Vadí" was one of the descendants of Sháh Síad Jalál, of whom I have already spoken. The dome in which she sleeps is erected of burnt bricks, which are cemented by mortar. The whole of the edifice is ornamented by various hues and lapis lazuli of the celebrated mines of *Badakhshán*. The size of this grand building may be estimated at about 50 feet high, and the circumference 25.

Though the clouds had unluckily obscured the light of the day, still we endeavoured to take a sketch of the Bíbí Jínd Vadí's mausoleum by means of the camera obscura. I herewith enclose a copy of it—[which we omit for reasons given on a formar occasion.—Ed.]

IX.—*Specimens of the Soil and Salt from the Sámar, or Sambhur lake salt-works. Collected by Lieut.* Arthur Conolly, *and analyzed by Mr.* J. Stephenson.

It is now more than a year since I received from my friend Lieut. A. Conolly the specimens named at the head of this article. They were on a very large scale, and packed up so carefully as to exhibit on arrival, almost as perfect a picture of the process and progress of the salt manufacture at the celebrated lakes of *Sámar*, as could be obtained by a personal visit to the spot.

At my request, Mr. Stephenson submitted such of the specimens as seemed to require it, to chemical examination in my laboratory, and where the results were unexpected, I verified them myself by re-examination. My sole reason for delaying the publication of these very interesting memoranda was, that I was in hopes Lieut. Conolly would favor me with a full account of the manufacture, which, however, public business and subsequently ill health obliged him to postpone—and thus time has crept on until the specimens themselves have nearly dissolved away in the damp air of the last rains; and unless I place on record what I already possess, there will hereafter be no means of consulting the perishable materials to prepare another report.

The labels which accompanied the parcel were so full and explicit, that, when followed by the chemical notes referring to the numbered specimens, they formed nearly as comprehensive a view of the opera-

tion as could be wished: I will therefore first place these before the reader.

Note on Sámar lake salt and earth, by Lieut. A. Conolly.

While acting as Salt Collector for two months at *Sambhur*, I employed part of my time in putting together officially some interesting notes, historical (semi-fabulous rather) and statistical, concerning this marvellous spot, collected by my friend N. B. Edmonstone, Esq. Superintendent of *Ajmír*, when he went to take possession for the Honorable Company at the beginning of the year (1835). Connected therewith it would be desirable to have scientific examination of the produce of the mines, for which purpose I send them to you under charge of a servant; and will here detail the contents of the boxes.

A 1.—A long box containing a quantity of the mud which forms the bed of *Sambhur* lake, and which yields as often as it is covered by (a few inches depth of) water, and acted upon by a hot atmosphere. This mud was dug out before me from the bed of a "*kiyár*" (or vat) just after it had yielded a good crust of salt crystals, when it was of the consistency of a stiff jelly. The mud nearest to the surface was put next to the part of the box at which the lid is laid hold of, (in order that it may be drawn out,) and so on downwards till the box was filled.

A 2.—A box divided into three parts, containing as many sorts of earth. 1st. Some of the black mud just mentioned, which has the depth of about half a *gaz* below the surface of the lake. 2nd. A bluish earth which soon hardens into a friable cake and seems a compound of what lies above and below it. This has a depth of half a *gaz* under the black mud. 3rd. A white sandy earth, which has a depth of from five to six *gaz* under the second strata. This I learned from the *Sambhur* Sherishtahdar who sent the specimens after me to *Jaipúr* on the 10th July. He wrote "under strata No. 3 lies white stone from which chunam is made." I immediately sent off an express to say that I would make the fortune of any enterprising digger who would dive for some of this stone, but the Serishtahdar returned for answer that the attempt had been made in vain, (rain) water having covered the whole surface of the marsh. He dug on the very edge of the lake, where there was no black mud, but only the earth No. 2, and he found nothing but this (he wrote) to the depth of 6 *gaz*, when the influx of water obliged the diggers to give over work. He wrote moreover, some of the "oldest inhabitants say that all parts of the lake are not alike; that in some places you dig and find the three sorts of earth sent; in others, below the mud only '*sang i kuchet*' (?) In others again only mud that has no bottom."

I may further mention that the Serishtahdar wrote—"The people call the *gil i safeid, Pindole* (H.) and make whitewash from it." This inducing a belief that it contained lime, I poured vinegar on a bit which immediately effervesced. I fancy this sort of earth is used to make the very delicate porous vessels out of which the better sort of natives drink in summer.

A 3.—Three pieces from the surface of a *kiyár* (vat) off which a crop (crust) of salt had just been raked.

4. A piece of ditto, on which, apparently, the salt did not come out well.

5. A piece of ditto, near the edge on which the salt did not form.

6. A piece of ditto, the salt of which got mixed with scum while forming.

7. A piece which seems to have been similarly mixed, but which was cut from another *kiyár*, and said to be five or six years old. It has evidently been rained upon, and it was taken from under a sheet of rain water, by which more of it would have been melted had it not been old and *pakká*.

8 a.—A piece on the scum of which crystals were formed after rain had fallen upon it.

8 b.—A ditto ditto.

8 c.—A ditto ditto.

9. A piece the salt of which got somewhat mixed with mud when being formed, (probably from its being agitated by a strong wind) and on which a crust of scum settled.

10. A piece of crust, chiefly scum, such as is thrown aside as useless.

11. Other refuse pieces taken from a kiyár in which they had been lying neglected for, perhaps, some years.

12. Pieces of crust of *salt* from the surface of a kiyár.

13. Ditto ditto. N. B. These have been more or less smoothed and thinned by having been rained upon.

14. Bits of a fine crust of salt with a little scum on the top. This was cut with a phaurá from the surface of a kiyár.

14 a. Three other bits of a different kiyár.

14 b. Another of another.

The above five items are merely varieties to enable you to trace the process of formation.

A 15.—"*Bacheh*," or infant crystals, about the smallest size in which the mineral particles come to view on the surface of the salt mud, after the partial evaporation of a body of water covering it. These were taken from under a sheet of water six fingers (or three inches) deep.

16. Crystals about two days old (after first formation) six fingers' depth of water at first, $1\frac{1}{2}$ fingers' depth evaporated when crystals taken out.

17. Ditto about three days old; or when two of six fingers' depth of water had evaporated.

18. Ditto about four days after first formation, or when three of six fingers' water had evaporated.

19. Ditto of a fair (common) size, produced after about eight days' evaporation of six fingers deep water.—N. B. These crystals were found during the hot winds, when the day's heat was intense, and that of the night considerable.

20. Crystals which formed on a stick after it had lain seven days in the six finger water from which the last mentioned (19) were taken after eight days.

21. Ditto. The concretion is more rapid on a thread, or stick, or any thing that the water can get round, than on the surface of the mud.

22. Crystals made in a kiyár in 20 days during the hottest season. 12 fingers' depth of water at first, four remaining when crystals were taken out.

23. Crystals taken from the lake after a complete and uninterrupted evaporation of a body of water five or six, or perhaps more, inches deep.

24. Pink crystals from the surface of the marsh; formed by the rapid evaporation of a shallow deposit (or *puddle*) of water.

A 25.—Good *Sambhur* salt, such as a *byopárí* would call *pakká*, and readily buy.

26. Superior ditto, such as a *byopárí* would *covet*—a year or so old.

B 1.—" The grandfather of all salt" (the literal expression of the man who brought it.) A lump taken out of an old pit eight cubits deep, said to have been re-opened after a lapse of 100 years. In this may be observed several layers, but for which I should have been ready to believe that the diggers had arrived at the top of an under ground chain of salt mountains, such as those beyond the Indus, which ELPHINSTONE describes, and that they had just chipped off a peak. You must know that the bed of the *Sambhur* lake is, for the most part, as shallow as a dish, and that after the rains it gradually becomes dry; *when* dry the natives dig pits a few cubits' depth in the bed of the marsh, and pour the salt water that they thus obtain into vats (made with large stakes, grass, and earth), in which it evaporates in from eight to fifteen days, according to the depth of its sheet, and the state of the weather. A pit is dug for a few rupees, so an old one is not usually restored after the rains: the water deposited in it dries into a cake of salt at its bottom; then a little sand is blown in, and then another rainy season comes, and a second layer is formed, and so on for perhaps many seasons, when, the pit becoming filled, all traces of its contents disappear till the sinker of a fresh well hits upon them.

2. Another lump taken out of another pit three or four cubits deep.

B 3.—Another from another.

4. Another bit from another pit.—N. B. All four specimens were extracted when water was above them.

5, 6, 7. Lump crystals and intermediate strata of earth from other pits.

8 and 9. Loose crystals from a pit four cubits deep.—Ditto from ditto, eight cubits deep.—N. B. You will observe that nearly all the *Sambhur* salt crystals grow into the shape of a four-sided pyramid. I see in the Cyclopedia that the cube is given as the ascertained primitive form of 11 minerals, of which salt is one; please to *dissect* a crystal till you arrive at its nucleus, and if you have leisure, tell me the process of structure, for " *Sakambarí jí*," the tutelary goddess of the Chouhan Rajpúts, for one of whom she in the year 608 S. miraculously made the lake, appears to reverse the order of architecture in putting together her mineral particles, causing them to rise from a point to a base*.

10. A piece from a pit, the crystals of which are slightly coloured.

Examination of selected Specimens from the above. By J. STEPHENSON.

A No. 1.—*Mud from the bed of Sambhur Lake.*

An average portion digested in distilled water, and the filtered solution (which appeared of a reddish brown colour), subjected to the usual tests, gave the following results.

Nitrate of barytes,	Copious white precipitate.
Nitrate of silver,	Ditto flambent grey ditto.
Prussiate of potash,	No change.
Oxalate of ammonia,	Ditto ditto.
Litmus paper,	Ditto ditto.
Turmeric ditto,	Ditto ditto.

* The pyramidal appearance is merely from truncation of the cube. The solid angle of the cube seems to resist solution more than the rest of the crystal.—ED.

300 grains exposed to a gentle heat in order to drive off the moisture lost 107 = 35, 6 per cent.

100 grains of the dry mud was now put into solution, and the insoluble matter collected on the filter, washed, dried, and weighed, gave 70 grains.

The filtered solution treated with nitrate of barytes threw down a precipitate of sulphate of barytes, together with the colouring matter, which after washing, drying, and weighing, gave 17 grains = 10.4 sulphate of soda.

The solution now freed from the sulphate was next treated with nitrate of silver, from which a precipitate of muriate of silver was obtained, weighing 42 grains = 19.5 muriate of soda.

Insoluble matter,	70	0
Sulphate of soda,	10	4
Muriate of soda,	19	5
Loss,	0	1
	100	0

Examination of the insoluble matter from A No. 1, after the separation, as above, of the sulphates and muriates.

Fifty grains of the insoluble earthy matter now freed from the extraneous salts was treated with muriatic acid. A strong effervescence took place, and the digestion was continued for 12 hours, as there was reason to suppose that carbonate of lime was present. It was now repeatedly washed with pure water, and the remaining earthy matter, which the acid had not dissolved, separated and collected on the filter, well dried and weighed: it amounted to 37 grains.

The muriatic solution was now treated with oxalate of ammonia, which threw down a copious precipitate of oxalate of lime. This being well washed, and dried, weighed 11 grains = 8.6 carbonate of lime.

The remaining solution contained a considerable portion of loose muriatic acid, which being neutralized with pure liquid ammonia, a portion of alumina (tinged with yellow oxide of iron) was precipitated. This being separated by the filter, washed, dried, and weighed, gave 4 grains.

Calculating then for per centage, the composition of this earthy matter will stand as follows:

Matter insoluble in muriatic acid (silica,)	74	0
Carbonate of lime,	17	2
Alumina and oxide of iron,	8	0
Loss,	0	8
	100	0

A No. 10.—This I found to be chiefly composed of sulphate of soda, with the carbonate and muriate of soda in considerable proportion.

A No. 15.—This gave a trace of sulphate; otherwise good salt; though the crystals are small.

A No. 22.—When tasted gave traces of sulphate.

A No. 24.—Crystals of a pink colour, which disappear in the filtered solution; the colouring matter appears to be volatile—sulphate of soda predominates in this sample; no carbonate of soda present.

B No. 1, *from an old deep pit re-opened after* 100 *years. Examination by tests.*

Nitrate of silver,	Copious precipitate.
Nitrate of barytes,	Very copious ditto.
Oxalate of ammonia,	No change.
Prussiate of potash,	Ditto ditto.
Litmus paper,	Ditto ditto.
Turmeric ditto,	Ditto ditto.

A fair average sample was taken through the whole thickness of the lump.

100 grains exposed to a gentle heat lost 5.5 grains moisture.

100 grains treated with nitrate of barytes gave a precipitate, which after having been well washed and dried, weighed 136 = 83 sulphate of soda.

The filtered solution treated with nitrate of silver produced a precipitate of chloride of silver, which after having been well washed and dried, weighed 22 grains = 10.4 muriate of soda.

The composition of this sample is then as follows:

Insoluble matter,	1	0
Moisture,	5	5
Sulphate of soda, (and carbonate?)	83	0
Muriate of soda,	10	4
Loss,	0	1
	100	0

A No. 6.—The salt of which got mixed with scum while forming, appeared very wet.

When tested, this sample appeared to contain a considerable portion of alkali, especially the reddish coloured part called *scum* in the list.

100 grains dissolved, and the insoluble matter separated by the filter, washed and dried, gave 2 grains.

To the filtered solution was added acetic acid till the alkali became neutralized; after which it was treated with nitrate of barytes; the sulphate of barytes was precipitated, and having been well washed and dried, weighed 84 grains = 51 sulphate of soda.

Nitrate of silver threw down a precipitate of chloride of silver that weighed (after washing and drying) 30 grains = 14 muriate of soda.

In order to ascertain the quantity of alkali in this sample, 100 grains were dissolved in pure water, and treated (drop by drop) with sulphuric acid of specific gravity 1.116 till the exact point of saturation was ascertained, by frequently testing with litmus paper. Towards the point of saturation a strong effervescence took place. The solution was neutralized after 96 grains of the acid test liquor had been used, which is equal to 10 per cent. of carbonate of soda.

This sample being very wet, the moisture was ascertained in the usual way, and amounted to 23 per cent.

This sample, or rather what is called *scum* in the list, is composed of

Sulphate of soda,	51	0
Muriate of soda,	14	0
Carbonate of soda,	10	0
Insoluble matter,	2	0
Moisture,	23	0
	100	0

Samples A Nos. 25 and 26, called good and superior salt in the list, when tested, gave traces of sulphate; with this exception the crystals are good and pure.

The conclusions to be drawn from the preceding details are somewhat at variance with the general impression regarding the *Sambhur* salt lakes. At least my own idea, derived from conversation with natives engaged in the salt traffic, was, that the lake water was a deep saturated brine, which left so thick a cake of salt on evaporation in the hot weather, that it was cut out in blocks on the margin and brought away on bullocks.

It would seem, however, that the shallow lake, or inundation would of itself, leave a deposit too thin to be profitably worked; and that it is customary to dig reservoirs or *kiyárs* wherein several feet depth of water already nearly concentrated to brine, are allowed to deposit their crystals on drying; or the evaporation is aided by the introduction of sticks, up which the saline incrustation rapidly creeps.

The velocity of the spontaneous evaporation under the fierce sun and scorching winds of the western desert, is well exemplified by specimens A 15, the *bacheh* or infant crystals of one day's growth, through 16, 17, 18, to 19, the 8th day's produce; in the last the crystals are cubes of full half an inch base. Again we find crystals of the same size in No. 22, from the evaporation of 8 out of 12 fingers' depth of water in 20 days of the hottest season. In No. 23 the crystals from 6 inches depth of water are of $\frac{3}{4}$ inch base. The *size*, however, of the crystals depends greatly upon the undisturbed continuation of the process, and does not give us a clue to the quantity of salt deposited from a given depth of water, whence we might calculate the saltness of the lake itself at various periods of the season. The rate of evaporation itself may be estimated from the above data tolerably well; thus—"6 fingers in 8 days"—"12 fingers in 20 days"—will be nearly *half an inch in depth per diem!* The pits dug for the reception of the brine seem sometimes to be very deep, 10 or 12 feet; in these when deserted the deposit proceeds for several years, forming solid strata of salt separated by a streak of earth washed in during the rainy season. The accumulation is then dug out in mass: but in general the salt for sale is collected as it forms in the brine pits in a granular state, by which means it is freed from the more soluble salts with which it is accompanied. The *pakká* salt of the *byopáris* or traders (Nos. 25, 26), is of a large grain—the latter indeed in half-inch crystals,—and not very clean.

A circumstance of chief importance elicited by Lieut. Conolly's specimens, is the presence of the carbonate and sulphate of soda in considerable abundance among the saline products of the *Sambhur* lake. The greater part of the substance described by the manufacturers as *refuse* or scum, which is stated to be thrown away as useless, turns out on analysis to be carbonate of soda, contaminated with sulphate and muriate; and it is well deserving of inquiry, whether the discovery of so extensive a store of *natron* in a state of great purity, may not be turned to profitable account. In all the strata cut from the neglected *kiyárs* the carbonate is seen overlying the mixed sulphate and muriate, of an efflorescent snowy consistence. Sometimes the formation of the salt is prevented by its abundance as (in A 4, 5, 6); No. 5, I find on analysis to contain 40 per cent. of carbonate, with 30 of each of the other salts—and a little care in separating the crystals of these would leave it nearly pure.

Spicular crystals resembling nitre are seen in some of the specimens (A 11); they bear a very small proportion to the general mass. It is but necessary to refer to Mr. Stephenson's examination of other specimens, to form a clear idea of the conditions best suited for the separation and collection of the different salts; thus in the old deserted pits (B No. 1), the sulphate is obtained nearly pure: in A 6, 10, it is mixed with carbonate; in A 5, the latter predominates. As for the muriate, from its inferior solubility, this salt is readily separated in a state of purity from the brine.

The small proportion of lime in the earthy residue of A 1, from the bed of the lake, rather militates against the expectation entertained by Lieutenant Conolly from native report, of a subjacent stratum of this mineral.

The points now wanted to complete Lieutenant Conolly's description of the *Sambhur* salt manufacture, and the questions naturally induced from the information he has already given, are:

1. A topographical account of the lakes, their extent, general depth, position relatively to adjacent plains, sands, or hills.

2. The extent of the manufacture, produce, possible increase, price, and other statistical data.

3. Whether the carbonate and sulphate are worked and used? the quantity and price of these.

4. The exact process followed by the native manufacturers or collectors.

5. The specific gravity of the water, both of the lake and of the brine pits, at different seasons; which may be found in the absence of the means of determining it on the spot, by bottling off a portion

at stated times. This would also enable us to ascertain whether the carbonate existed in the water, or whether it was formed during the evaporation, by the action of the lime or other earths. The presence of magnesia, of potash, and of iodine also remains an undecided point, as well as the nature of the pink or amethystine colouring matter remarked in some of the specimens (A No. 24).

To conclude this hasty note, I may mention that I have found M. Gay Lussac's alkalimeter a very convenient instrument for examining these mixed salts. By preparing three standard bottles of dilute nitric acid, nitrate of barytes, and nitrate of silver, adapted to his centesimally-divided dropping glass, the per centage of carbonate, sulphate, and muriate, is obtained successively from the same specimen with great ease and rapidity.

J. P.

X.—*Remarks on a collection of Plants, made at Sadiyá, Upper Assam, from April to September*, 1836. *By* William Griffith, *Assistant Surgeon, Madras Establishment, on duty in Upper Assam.*

The following remarks may not be uninteresting, as they concern a portion of India of which, especially so far as regards its natural productions, but little is known. I must beg, however, to point out that they must be considered as outlines only of a slight sketch; since the amount of plants collected in *Assam* does not probably exceed 1,500, and this can scarcely be considered more than one-fourth of its whole Flora.

The greater portion of *Assam* that I have seen, may be compared to an extensive plain, intersected in various manners by belts of jungle, the breadth of which, although extremely variable, does not, except towards the hills enclosing the valley, seem to be often very great. But as we approach towards the eastern boundary, the spots unoccupied by jungle become fewer and less spacious: so that between *Kujoo Ghat* on the *Noa Dehing*, and *Nungroo* on the *Booree Dehing*, and in the whole of that direction, the country is almost exclusively occupied by jungle. The characters of a plain intersected by narrow belts of jungle is very obvious about *Sadiyá*, at which place the collection was almost entirely formed.

The peculiar feature of *Assam*, especially its lower and central divisions, consists in the vegetation of its churs, or tracts of sand, very often of great extent, which are stretched along the *Burhampootur*. The breadth of these tracts, taken together, is, in some places, from 8

to 10 miles. They may be said to be throughout their whole extent exclusively clothed with dense grass jungle.

Up to *Rungpoor* the eye meets nothing but grasses, and an occasional Bombax, a tree remarkable for its ramification, the branches being nearly approximated in whorls, and forming right angles with the trunk. About *Buggooa Mookh* belts of jungle begin to appear, here and there approaching to the banks of the river. From this place upwards the belts increase in extent and number, and from *Seloni Mookh*, just below the confluence of the *Dihong* with the *Burhampootur* to *Sadiyá*, they proponderate much over the grassy tracts. Above *Sadiyá* these tracts recommence at least on the northern bank, but they disappear soon entirely: the grasses that clothe the churs are, especially throughout Lower and Central *Assam*, of gigantic size, some of them often measuring 20 feet in height. They consist of four or five species of Saccharum, the kuggra, mog, (white,) molaha, (red) and telee, (blackish,) of the Assamese, and a species of Arundo, which is perhaps the longest of all, the nul (or podomolee*) of the natives. Towards *Sadiyá*, however, very large tracts are covered with Imperata Cylindrica, the *ooloo-kher* of *Assam*, which grows to the height of 5 to 7 feet. As the genus Saccharum far preponderates over the others, and is perhaps during its inflorescence one of the most conspicuous genera of the order, the appearance presented by the churs during the flowering of their occupants, can be more easily conceived than described.

It may perhaps be convenient to consider the botany of *Assam* under the following heads.

I. Botany of the *Burhampootur*, including the churs.

Of these, Gramineæ form, as I have said, almost exclusively the Flora. Of the immediate banks, the predominant order is,—Compositæ, Polygoneæ, Scrophularineæ, Gramineæ, (among which is a species of Alopecurus,) Boragineæ, have several representatives: from *Jorháth* upwards to *Diboroo Mookh*, a large annual Ranunculus occurs extensively, and throughout the same distance large patches not uncommonly occur of a species of Irematodon, *(I. sabulosus, mihi,)* a species of Polentilla is also not uncommonly met with.

II. Botany of the plains.

Predominant plants, Gramineæ; of these the most common about *Sadiyá* are Imperata cylindrica, Saccharum spontaneum, Saccharum fuscum (Roxb.) in wet places, and a probably new, large and coarse species of Panicum. Among these may be found two or three Orchideæ, Polygoneæ, Leguminosæ, Cyperaceæ, one Viola, and a species of Exacum which is particularly conspicuous from its bright blue flowers.

* See Buchanan's *Dinájpur*, p. 168.—Ed.

Those parts of the plains which have at a previous period been cleared for cultivation, but are now unoccupied, present the usual tropical features; and are occupied chiefly by Cyperaceæ, among which occur one or two Gramineæ, several annual Scrophularineæ, and small Alismaceæ.

III. Botany of the belts of jungle.

IV. Botany of the foot of the boundary hills.

On this last I am not able to offer any remarks. It will be found excessively rich in ferns, and next to these perhaps in Cyrthandraceæ. The only opportunity that has hitherto been allowed me of visiting any portion of these boundaries above *Gawahatti*, occurred at *Gubroo Purbut;* and I was then fortunate enough to meet with an Alsophila 30 feet high, a Sollyana, (mihi,) and Kaulfussia Asamica. Of the third division, the botany is very varied; so much so, that no one prominent feature seems to present itself. It is to this section that by far the greater number of species contained in the collection will be found to belong; and I shall hence pass in review the orders composing it—reserving the few observations I have to make on the most interesting plants to a subsequent part of this paper.

To those orders, the presence of which indicates the climate of northern latitudes, or of a tropical one at considerable elevations, I have appended an asterisk; and to those which, though usually tropical, include plants which have hitherto only been found at comparatively high elevations, I have appended a cross.

Dicotyledones.

*Ranunculaceæ,	3	Dipterocarpeæ,	2
*Magnoliaceæ,	1	Tiliaceæ,	5
Anonaceæ,	6	Elæocarpeæ,	1
*Umbelliferæ,	7	Lythrarieæ,	1
Araliaceæ,	3	Meliaceæ,	8
Ampelideæ,	15	Aurantiaceæ,	7
Onagrariæ,	1	Rhamneæ,	5
Loranthaceæ,	1	Euphorbiaceæ,	15
Alangieæ,	1	Hippocrateaceæ,	1
Melastomaceæ,	5	Malpighiaceæ,	2
Memecyleæ,	2	*Conariæ,	1
Myrtaceæ,	4	Tranthoxyleæ,	5
Cucurbitaceæ,	12	Balsamineæ,	5
Begoniaceæ,	1	Casyophylleæ,	4
*Cruciferæ,	3	*Rosaceæ,	6
Capparideæ,	3	Leguminosæ,	41
*Violarieæ,	2	Connaraceæ,	2
Guttiferæ,	2	*Cupuliferæ,	2
*Temstræmiaceæ,	3	Urticeæ,	24
Sapindaceæ,	3	Artocarpeæ,	18
*Hippocastaneæ,	1	Stilagineæ,	2
Herculiaceæ,	1	*Chlorantheæ,	1
Bythneriaceæ,	1	*Saurureæ,	1
Malvaceæ,	4	Piperaceæ,	5

*Thymeleæ,	1	Acanthaceæ,	8
Proteaceæ,	1	Scrophularineæ,	20
Laurineæ,	6	Orobancheæ,	1
Amaranthaceæ,	5	Compositæ,	39
†Polygoneæ,	12	*Plantagineæ,	1
†Menispermeæ,	19	*Gentianeæ,	1
*Primulaceæ,	1	Apocyneæ,	8
Myrsineæ,	6	Asclepiadeæ,	9
Styraceæ,	3	Oleinæ,	5
Convolvulaceæ,	6	Jasmineæ,	2
Rubiaceæ,	36	*Boragineæ,	3
Lobeliaceæ,	1	Cordiaceæ,	1
*Campanulaceæ,	2	Ehreliaceæ,	4
*Sambuceæ,	1	Solaneæ,	6
*Viburneæ,	2	Gnetaceæ,	1
Cyrthandraceæ,	7	Incertæ sedis, including Roydsia,	31
Verbenaceæ,	11		
Labiatæ,	14	Total,	523

Monocotyledones.

Scitamineæ,	9	*Junceæ,	2
Canneæ,	1	Palmæ,	3
Hypoxideæ,	1	Tupistra,	1
Amaryllideæ,	1	†Butomeæ,	1
Hydrocharideæ,	1	Alismaceæ,	10
Arordeæ,	3	Eriocauloneæ,	1
†Smilaceæ,	7	Gramineæ,	37
Dioscoreiæ,	2	Cyperaceæ,	28
Ponledereæ,	2		
*Orchideæ,	15	Total,	126
Polamogeton,	1		

Acotyledones.

Equisetaceæ,	1	Filices‡,	34
Lycopodiaceæ,	5		
		Total,	40

Of *Anonaceæ* I shall only notice Sphorostemma, Blume. In this genus the connectivum is highly dilated, and the cells of the anther at a considerable distance from each other; and yet from the *arrangement* of the stamina, bilocular anthers with contiguous loculi result.

It affords another instance of the existence of the peculiar tissue, until lately supposed to be characteristic of Gymnospermæ. In addition to this singularity, its medulla is traversed longitudinally by bundles of dense, occasionally branched, woody fibre, which consists of a superposition or "emboitement" of several layers.

Cucurbitaceæ. Among these plants occur two genera which appear to be new, so far at least as the Prodromus of M. De Candolle is concerned; in which book the article on Cucurbitaceæ, (by M. Seringe,) appears to me to be very unsatisfactory. Of one of the above genera, I have only seen the male; it is remarkable for the involute, or rather gyrate involution of the petals. The second I propose calling Actinostemma: it is chiefly remarkable for the complete separation of its sta-

‡ Chiefly from the foot of the Abor Hills, on the *Dihong*.

mina; for the "dehiscentia circumcisa" of the fruit; and, above all, for the pendulous direction of the seeds. It approaches in some points to Zanonia. I am not aware whether the peculiar nature of the arillus of this order has been explained or not; it is a separation of that portion of the tissue originally surrounding and in close contact with the ovula. Hence it is a shut sac; and hence, too, it is wanting in Actinostemma, in which the cavity of the ovarium is not filled by a production from the placentæ.

Conariæ. In Conaria, of which I have one species from the Abor Hills, the raphe is certainly external with regard to the axis. I have not been able to ascertain whether this depends upon any torsion of the funiculus, which Mr. Brown has stated to be the case in other instances of a similar anomalous situation.

Of *Saurureæ* Houttuynia is the only example. This plant, which was originally described by Thunberg, appears latterly to have been more misunderstood than by the original describer. I have had no opportunity, however, of examining the work of Thunberg in which the plant is described. And I ought, perhaps, to except M. Meyer, who has published "De Houttuynia atque Saurureis," with which work I am unacquainted. I find each flower throughout the spike, except perhaps the terminal one, to be subtended by a very small bracte. Of these, the four lowermost, rarely only three, are highly developed and petaloid, forming the spatha.

The number of stamina to each flower is, excepting those at the apex of the spike, almost invariably three, and always equal to the carpella entering into the formation of the female organ; and of these the third is always next the axis. The terminal flower has from five to seven stamina; the space between this and the uppermost triandrous hermaphrodite (?) flowers is occupied by an assemblage of male flowers, with a variable number of stamina, but never greater than three, and usually, I think, two. That such is the structure of this portion is proved by the presence of bractea, similar to those of the lower portion, interspersed among the stamina. Dr. Wallich says, in Flora Indica, I. 362—"In the numerous spadices which I have examined, I have with Father Loureiro invariably found three staminas, and as many styles attached to each ovarium: the former above the base, the latter at the apex of its angles. I have not, therefore, hesitated continuing this most interesting plant in the very class and order where it has been placed in the Flora of Cochinchina. As there is no reason for considering it at all different from the original *Japan* plant, I am at a loss to account for the difficulty which the celebrated Chevalier Thunberg experienced in determining its

station in the sexual system; nor can there be at present any doubt of its neither belonging to Heptandria, Polyandria, or Monæcia." Thunberg was, however, so far as I can see, right; for he paid, in all probability, exclusive attention to the composition of the terminal flower, on which, in certain cases, the Linnæan rules lay much stress. Taking this into consideration, Houttuynia may be referred to Heptandria, Polyandria, or Monæcia; most correctly to the latter, and least correctly to Polyandria. But as,—so far at least as regards the Linnæan system,—the most obvious characters are the best, it is advisable to keep the plants still in Triandria Trigynia. The structure of the seed has been likewise totally mistaken. In the Flora Indica, loc. cit. the embryo is placed at the wrong end of the albumen, and is mistaken for the embryonary sac. The real embryo is a much more minute organ contained in this, " the vitellus," or membrane of the amnios of Mr. Brown. Dr. Hooker describes Dr. Wallich's account as most correct; but he does not define the situation of the embryo otherwise than by saying that it is situated at one end of the seed. Lastly, the plant does not belong to Aroideæ, nor even to Monocotyledones. Notwithstanding the apparent solidity of true embryo, yet the more important nature of the structure of the stem is sufficient to point out that it is Dicotyledonous, or rather Exogenous; and among these, its true place is, beyond doubt, Saurureæ.

Of *Thymeleæ* one species only occurs, which is apparently referrible to no published species of the order. To this I have attached the MSS. name of Jenkinsia, in compliment to Captain F. Jenkins, Agent to the Governor General on the North-East Frontier, to whom Botany, among other sciences, is considerably indebted.

Of *Menispermeæ* the majority are interesting. Cissampelos is the only genus with which I am acquainted, in which the ventral suture of the ovarium is anticous, or not next the axis. I am not certain whether the most correct way of understanding the curious structure of the female flowers is not to assume the aggregation of four flowers, which, in the only species I have examined, appears constant, as a complete quaternary division of one only. It remains to be ascertained whether the singular reversion of the situation of the ventral suture is more uncommon in aggregate than in solitary carpella.

Of the genus *Stauntonia*, *Assam* has two species, but only one is contained in my collection. The anomalous structure of the fruit has no doubt been explained by Dr. Wallich in his Tentamen Floræ Nipalensis, in which it is published under the name Holböllia, but which I am at present unable to consult. I find that the placentation of this genus is similar to that of Flacourtianeæ, with which

order I am not acquainted, and to that of Butomeæ; and hence the anomalous situation of the seeds. At the period of expansion of the flower, the ovula are much less developed than is almost universally the case: they present indeed the appearance of ovula at the earliest stages of development. I refer to this order a plant with long racemes of ternarily aggregate fruits, notwithstanding that it has milky juice, and that the Cotyledons are large, foliaceous and obliquely situated with regard to each other.

Among the *Cyrthandraceæ* a species occurs, (Chiliandra obovata, mihi,) remarkable for the structure of its mature anthers. These dehisce in a labiate and incompletely bivalvular manner, the lower and smaller valve being alone half reflexed. This valve is compound, and due to the mutual adhesion of the originally distinct inner locellus of each loculus. To this formation I have adverted in a short memoir on Rhizophoreæ, published in the Transactions of the Medical and Physical Society of Calcutta, although I was at the time ignorant of the existence of an example. *Assam* contains another interesting species of this family: this, which is remarkable for its pentangular petaloid calyx, and the "dehiscentia circumcisa," of its fruit, in which it approaches to Aikinia of Mr. Brown, I propose calling Cyananthus.

Scrophularianeæ afford one new genus, (Synphyllium torenioides, mihi,) an account of which will appear in the Journal of the Madras Literary Society, edited by my friend Mr. Cole.

Asclepiadeæ contain some interesting species, of which one constitutes probably a new genus, unless, indeed, it is referrible to Dr. Wight's Heterostemma, from which it would appear to differ in the valvular æstivation of the corolla. This species is remarkable for the aliform processes running along the larger veins of the under surface of the leaves.

To this order, or to Apocyneæ, is to be referred a remarkable plant, distinguished by the numerous longitudinal foliaceous alæ of its follicles, and, I speak from memory, its serrated leaves. This plant, which I have seen near *Mergui* on the *Tenasserim* coast, seems to have been sent by Captain Jenkins to Dr. Wallich with many others, none of which appear, however, to have excited much attention.

Among the *Boragineæ* we find one Myosotis and a species which, with the habit of some Anchusæ, appears to be not referrible to any genus of the order. The "umbilicus" occupies the centre of each carpellum, and is surrounded by an osseous elevated margin. The origin of this is totally distinct from that of Myosotis, and is wholly independent of fecundation. The radicle is in addition inferior.

The Monocotyledonous forms are chiefly those of other parts of India. Among the *Orchideæ* two species of Calanthe, and two of Pogonia occur, as well as one species of Spiranthes. Among the Gramineæ the most interesting is a Diandrous species of Alopecurus, which genus is, I believe, new to India; at least to any portion of the plains.

Of the Cyperaceæ, I shall only advert to the existence of four species of Carex, two of which are, however, from the Abor Hills; a third, which was originally sent by Captain Jenkins to Dr. Wallich, appears to be widely distributed, extending from *Gawahatí* to *Jorháth*; the fourth; I have only met with about *Sadiyá*.

But perhaps the most interesting plants of the whole collection are contained among those "incertæ sedis," a division, always to a beginner, of great extent. Most of these are from the lower ranges of the Abor Hills; and the appearance of these is quite sufficient to ensure their being of great interest.

XI.—*Note on a Remnant of the Hun Nation.* [*Vide Chap.* 26 *of the "Decline and Fall of the Roman Empire" under the head of "Original Seat of the Huns."*] *By Captain* W. Foley.

"One of the princes of the nation *(Hun)* was urged by fear and ambition to retire towards the south with eight hordes, which composed between forty and fifty thousand families; he obtained under the title of 'Tanjou' a convenient territory on the verge of the Chinese Empire." (A. D. 48.)

Now, there are a people located in various parts of the *Bama* (Burmese) and *Shan* (Siamese) empires, who are distinguished by the appellation of "*Ton-soo*" or "*Ton-dzoo*:" they have a language of their own, and differ in feature, dress, and domestic manners from the inhabitants of the country in which they reside; they never intermarry with their neighbours, and assert their descent from "a *people who came from the north*;" they are an ugly, swarthy race; both men and women closely resembling the picture of the *Huns* drawn by Gibbon in his immortal history. Broad faces, flat noses, small eyes, short, squat (but athletic) figures, are the most prominent beauties. The men wear their hair long in common with the *Bama*, but their dress, which is always of a dark colour, much resembles the garb of the Chinese: the women have a fillet of dark-coloured cloth (generally with a red or white border) tastefully arranged as a head-dress, and falling down over the back; a mantle of the same colour and material extending from the shoulders to a little beyond

the knee, is the only remaining garment. Their legs, which are extremely thick, are covered with a number of metal bangles; these, with the exception of the ear-ring (*nad-dán*) are the only ornaments worn by the females of the *Ton-soo* race.

I am persuaded that these people are the descendants of the "Tanjou" described by Gibbon, a *remnant of the ancient Huns!!* preserved during a lapse of 1788 *years* uncontaminated with the blood of strangers!!

Turning over the pages of Gibbon very lately, I happened to notice the subject. I regret exceedingly that I was not aware of this singular coincidence during the time of my temporary residence in the neighbourhood of this people—how much might have been elicited!

XII.—*Table shewing the breadth of the river Satlaj and the rate of its current at different stages from Harríke Pattan to its junction with the Indus at Mithankot.*

[Communicated by Capt. C. M. Wade*.]

Names of the Stages.	Breadth of the river Satlaj.	Rate of the current.	Names of the Stages.	Breadth of the river Satlaj.	Rate of the current.
	In yards.	Kts. Ft.		In yards.	Kts. Ft.
At Harríke,	352	1 32	At Pala,	306	1 05
,, Bundáli,	220	1 24	,, Núrpúr,	360	2 03
,, Firozpúr,	308	1 32	,, Khyrpúr,	381	1 34
,, Mamdot,	528	1 30	,, Núr Mohamad kí goth,	176	1 04
,, Khúghgí,	154	1 20	,, Gúldera,	308	1 30
,, Karrian,	220	1 22	,, Bahawalpúr, or Bindríwalá,	616	1 06
,, Ladúke,	308	1 40	,, Náharwalá,	220	2 01
,, Jagvairá Salemká,	264	2 00	,, Buddúke,	308	2 00
,, Juwunda Búngá,	154	1 13	,, Mírpúr,	572	1 04
,, Chúnní,	418	1 35	,, Makkhanbelá,	605	2 00
,, Bachawalí,	264	1 13	,, Sítpúr,	577	1 40
,, Jhúlná,	484	1 41½	,, Shydaná,	572	2 01
,, Akokí,	572	2 00	,, Mithankot,	858	1 13
,, Khajh Bazídpúr,	198	1 41			
,, Núnkeh,	266	2 00			

* We were in hopes ere this to have been favored with a copy of Captain Wade's journal and survey of the river *Satlaj*, for publication. Specimens of the soil and rocks on the banks have been long in our possession, awaiting further illustration, which want of leisure has doubtless prevented.—Ed.

TABLE, No. 2.

Shewing the distance of the Stages in Miles, and the Soundings of the River from stage to stage.*

Names of Stages.		Sounding.	Av.
From Harríke to			
,, Bundáli to	13	14 feet.	
,, Firozpúr to	10	10,8,12,16,12,11,12,10,11,9,12,14,12.	10½
,, Mamdot to.....	14	11,12,14,14,14,12,12,6,5,6,6,7,8,12,11,14,6.	10
,, Khúghgi to	13	8,8,12,6.6.6,6,5,13,8,5,5,5,12,14,10,	8
,, Karrían to.....	9	10,18,16,22,11,10,11,9,12,2,	13
,, Ladúke to.....	13	12,12,12,9,9,7,14,12,9,11,15,6,15,11,15,8,7,15,17,14.	11½
,, Jagvairá to.....	23	7,6,5,13,5,12,10,12,18,22,14,9,20,9,12,14,12,22,11, 10,14,14,6,6,14,10,11,5,3,5,10.	11
,, Juwunda Búngá,	8½	14,14,14,6,6,14,10,5,5,5.	9
,, Chúnni to	11	8,10,14,10,12,9,12,9,10,8,7,7,13,6,12,12.	10
,, Bachawalí to.. ...	13	8,11,13,12,8,7,6,6,3,5,8,12,12,14,14,8,8,8,6.	9
,, Jhúlná to	16	8,8,9,9,6,14,15,14,8,7,12,16,11,16,15,15,16,12,12,14, 9,11,6,7,6,6.	10¼
,, Akokí to	13	6,14,14,15,12,9,11,11,11,11½,8,9,10,7,18,14,18,13.	11¾
,, Khajh Bazídpúr,	15	12,12,9,8,6,7,6,5,9,11,13,12,8,7,6,6,6,5.	8½
,, Núnkeh to	12	5,4,6,7,11,12,14,3,3,3,3,4,7,11,11,24,4,4.	8
,, Pala to	13	14,14,11,7,16,12,8,11,8,8,9,9,6,7,12,13,18,11.	10¾
,, Núrpúr to	24	11,16,9,7,6,7,13,14,15,6,7,9,20,8,6,8,7,8,12,14,15,6, 7,9,15,9,10,10,11,7,14,16,16,16.	11¾
,, Khyrpúr to	20	7,10,6,11,12,18,14,12,18,9,16,12,11,12,11,6,8,12,11, 7,5,12,10,11,11,9,14,11,13.	10¾
,, Núrmohamad, ..	10½	9,11,14,15,14,15,11,11,12,16,7,6,15,8,7.	11¾
,, Gúldera to	12	7,5,11,6,7,11,16,9,12,18,19,11,11,9,7,20,8.	11½
,, Bahawalpúr to ...	11½	11,9,8,16,18,13,9,13,14,18,18,8,9,12.	11½
,, Náharwalá to ...	11	12,13,7,12,11,9,6,9,8,7,6,9,12,18,9.	10
,, Budduke to	5½	9,12,16,16,13,7,6,14.	11½
,, Mírpúr to	14	7,6,14,17,16,13,7,11,20,16,12,13,14,12,12,18,12,11, 14,12.	16
,, Makkhanhelá, ..	13	9,7,15,9,7,9,12,19,15,9,18,14,18,24,21,19.	14
,, Sítpúr to	10	14,11,17,18,14,12,14,18,7,9,12.	13
,, Shydaná to	14	24,24,15,13,14,9,14,17,24,12,12,12,12,12,12,13.	15
,, Mithankot,.....	15	11,9,8,14,12,12,13,24,17,12,13,14,17,18,15,24,27.	14

TABLE, No. 3.

Shewing the distances both by water and land from Ropar to the principal towns on the Satlaj as far as Mithankot.

Names of places with their distance from Ropar.	Akbarí Kos.		Statute Miles.	
	By water.	By land.	By water.	By land.
From Ropar to Lodiáná or Filor Ghát, .	37	32	46½	40
,, Ditto to Harríke,...	86½	77	108½	96
,, Ditto to Firozpúr, ...	104	95	132½	119
,, Ditto to Mamdot, ...	118½	105½	148½	132
,, Ditto to Gaurjiáná, ...	174	149	216½	186
,, Ditto to Fatehpúr, ...	274	224	342½	282
,, Ditto to Bahawalpúr,.....	307	248	385	313
,, Ditto to Cuch, ...	346	277	433	337
,, Ditto to Mithankot, ...	381	310½	476½	388

* These soundings were taken hetween the 1st of Jan. and 7th of March, when the river is at its lowest depth throughout.

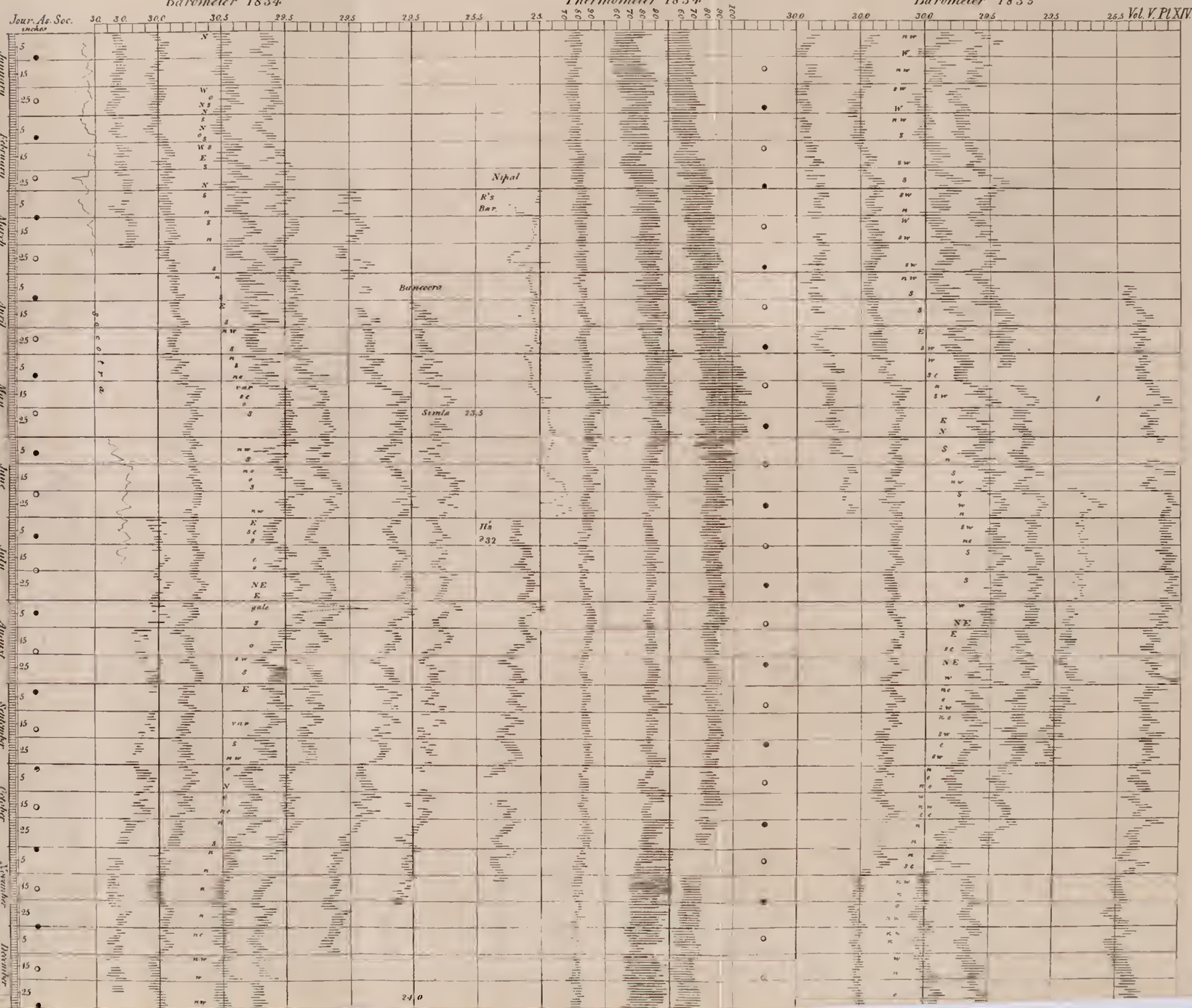
XIII.—*A Comparative view of the daily range of the Barometer in different parts of India. By* James Prinsep, *Sec. As. Soc. &c.*

The friends who have for the last two years favored me with copies of their Meteorological Registers, have doubtless accused me of a most ungracious requital of their labours, in the long slumber to which they have apparently been devoted in my editorial escrutoire! Such is not absolutely the true state of the case; but the number attached to the accompanying plate* will, I fear, testify against me to the extent of having kept back for nearly a year, the curious facts that had been elicited from the possession of so many valuable records of the weather.

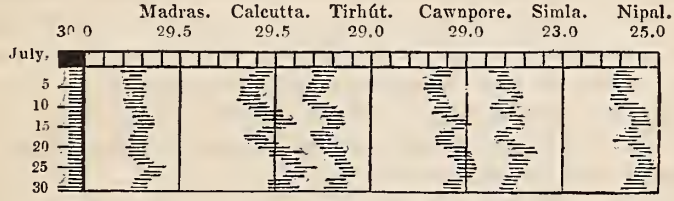
The fact is, that the prompt attention with which my appeal was answered by observers of the weather in numerous parts of India, served as a check to the immediate publication of the materials supplied. The very voluminous dimensions of such registers, and their dry and unperusable nature, even by the few who would like well to consult them, set me about contriving some method of condensing their results into convenient compass, and exhibiting them to the eye in a manner more perspicuous than could possibly be accomplished by a mass of mere figures.

The usual form of a diagram of zigzag lines from point to point would apply tolerably well to a series of single daily observations, taken at a particular hour, and would trace out in a gently undulating curve, the course of annual variation; but if made to embrace the double daily oscillation, now well known to be steadily pursued by the Barometer in intertropical climates, it was evident that the alternations would be too confused on a small scale to be followed pleasantly by the eye. A slight modification suggested itself, as calculated to remove all objections to this mode of displaying the phenomena, without taking in any degree from the accurate notation of the fixed points of observation, while it represented more palpably the amount of daily oscillation. The modification to which I allude will be readily understood by inspection of Plate XIV. It consists in breaking the connection between the consecutive days, and merely laying off, in short parallel lines, the interval between the maximum and minimum readings of the instrument. The proximity of the lines enables the eye to fancy an imaginary line drawn centrally through them to represent the mean course, without the necessity of drawing it, while errors of the tenth of an inch, so liable to occur, and so difficult of detection in a series of figures, became at once obvious and remediable. The chief

* It was first printed as Plate IX. subsequently altered to XIV.


Barometer 1834
Thermometer 1834
Barometer 1835
Jour. As. Soc.
inches
Vol. V. Pl. XIV.
January
February
March
April
May
June
July
August
September
October
November
December
Nipal
R's Bar.
Banaeera
Simla 23.5
Hs 232
Calcutta
24.0

advantage, however, of the plan of parallel lines was, that type might be adapted to express the observations with as much facility as to a figured statement. Having the brass rules of my calendric scales already divided according to the days of the year, it only would be requisite to cast a quantity of rules of the thickness of one day, and exactly one-tenth of an inch in breadth; the printing surface of some being retained of the full length, and that of others reduced successively one hundredth, two hundredths, three hundredths, &c., so that nine varieties, and a large supply of blanks or quadrates of the same dimensions, would be sufficient to lay off any series correct to the hundredth of an inch, which is ample for most purposes. I here give a sample of this mode of registry in type, although, as I had previously engraved a copper-plate divided for the purpose, I have not, on the present occasion, made any use of the typographic plan, in spite of the far greater expedition and precision of which it is capable.



It is merely necessary to denote by figures at the top, the value of the neutral line from which each set of readings is to be estimated right and left, in some even division of the inch, as 29.50 inch for *Calcutta;* 29.00 inch for *Tirhut*, or 25.00 for *Nipal*, &c. To reduce the lines into figures when requisite, an ivory inch scale may be applied, but this will seldom be necessary if such linear tables are accompanied by monthly abstracts in the ordinary form: the chief advantage of the lines being to shew at a glance the variations of pressure or other phenomena, during the month, in a very small compass, and for many localities at the same time.

Having thus explained the principles upon which the accompanying plate was filled up,—a work of no small patience by the way, seeing that it contains 13 columns of 365 double entries, or nearly 10,000 individual measurements laid off by scale to the hundredth of an inch,—I will proceed to notice, first, the authorities whence the various columns are derived; and, secondly, the instructive and highly curious facts it discloses.

The *Madras* column is extracted from the registers published by Mr. Taylor, the H. C.'s Astronomer at *Madras*, in the Journal of the Literary Society at that place. For the *Bombay* column I am indebted

to my brother Assay Master, Mr. Noton, who kindly sent me copies of some registers made mostly during his absence. The series is broken in many places, and the observations between June and October, 1834, were evidently taken by an inexperienced hand. The single line marked *Socotra* is from the register kept by Captain Haines while engaged in the survey of the island. As the hours chosen hy him were not those of the maximum and minimum, I thought it best to confine myself to the noon readings as a mean of the day. The *Calcutta* columns are taken from my own registers, published in this Journal. The *Tirhút* diary was kept at my request by my cousin, the late Mr. Thomas Dashwood, Judge at *Mozafferpur*, who kept it up unremittedly for three years and a half, indeed until a very few days before his sudden and lamented death*. One year of this series has already been published at length in the 2nd and 3rd volumes of the Journal. For the *Cawnpore* register I am beholden to Colonel G. Pollock, C. B. of the artillery. This series is unfortunately intermittent, from his having been obliged to send his barometer to *Calcutta*, in December, 1834 : which, however, furnished an opportunity of comparing it with my own standard. A little to the right of the *Cawnpore* line for 1834, are entered the observations of Mr. Ritchie at *Bancoora*, for April and May, also abruptly terminated by his falling an untimely victim to the climate.

The last series to the right I owe to Captain Robinson of the *Nipal* Residency; it was made partly with his own and partly with Mr. Hodgson's instrument, which will account for the shifting of the index point in June, 1834. In March also two adjustments were attempted by boiling the tube. These do not affect the utility of the register, when once noted. Captain Robinson's tables are invaluable from the number of periods during the day they embrace, but these will be alluded to hereafter in summing up the figured abstracts.

I was disappointed of getting any observations from the western hills, (the seat of the grand trigonometrical operations still going forward in those parts,) until after the plate had been long finished and the whole edition struck off, when Mr. H. S. Boulderson of *Moradabad* kindly transmitted me a file of observations taken by his brother, Mr. S. M. Boulderson, at *Simla*, between May and November, 1834. Rather than lose the valuable additional evidence which this register, at a position elevated about 7000 feet, and situated 400 miles to the west of *Katmandhu*, would afford, I have caused it to be

* An apoplectic fit terminated his life of exemplary public service and private worth, at the very moment of his quitting employment, and retiring home to devote his latter days to the education of his family in England.

inserted, under the *Bancoora* column, heading the index line 23.50, to correspond with the average range of the barometer at *Simla** and have reprinted the plate.

The first feature in the table that attracts attention is an almost perfect parallelism in the march of the barometer at *Calcutta*, *Bancoora*, *Mozafferpur*, *Cawnpore*, *Nipal* and *Simla*—places situated many hundred miles asunder from $22\frac{1}{2}^{0}$ to 28° north latitude, and 80° to 88° east longitude, with altogether differently prevailing winds and climates, and opposite geographical features. The same parallelism continues even as far south as *Madras*, but the *excursions* are there much subdued in every respect, and occasional deviations are observable, which seldom or never occur in the three Gangetic lines, except from such a local hurricane as that experienced in the immediate neighbourhood of *Calcutta* on the 3rd August, 1834. Between *Bombay* and *Calcutta*, little conformity of detail can be perceived, though the general direction is symmetrical. There is, however, considerable accordance between *Bombay* and *Madras*, the former having from its higher latitude a wider range of oscillation, both annual and intermediate.

The direction of the wind (at least of the lower stratum) alone seems quite insufficient to account for the barometrical variations, although it is generally true that the mercury rises with the prevalence of northerly, and falls with that of southerly winds, as might be expected from the different specific gravity of a warmer or colder atmospheric column. That the moon also has no regular influence appreciable on the scale of my table, must be, I think, also granted; for as many instances occur of a falling as of a rising barometer at the changes of lunar phases. The course of the thermometer, on the contrary, seems to have a decided connection with that of the barometer. This is exemplified in the comparative uniformity of the *Madras* line, and the increased curvature at other places. For convenience of division I assumed the tenth of an inch, as representing 10 Fahrenheit degrees of temperature. Had I taken double that amount, the general thermome-

* Having the former copy of the plate at hand, I have distributed it detached along with the other, hoping it may attract notice and procure me a fuller collection for some future year.

I have been also favored with a daily barometrical series for 1836 at *Bangalore*, by Dr. Mouat, but I have reason to think that the instrument used was sluggish in its movements. I trust, however, for the ensuing year, the labours of this zealous observer will be made available by the possession of better instruments. I have further many other broken series from *Assam*, *Kyouk Phyoo*, *Candy*, &c. but they are generally wanting in the barometer. A short series was also kept for me by Lieutenant Montrion, I. N. at the head of the bay in January and February, 1833.

tric curve for the year would have been nearly symmetrical with that of the barometer, except during the rainy season.

It should be remarked, that the daily undulations of temperature for *Calcutta* and *Tirhút*, are the extremes indicated by a register thermometer exposed to night radiation and noonday sun: those for *Madras* are only the variations of morning and afternoon heat in the shaded air. They both, however, but the former more distinctly, shew to the eye the influence of clouds and rain in diminishing the diurnal excursion; and in this respect a direct accordance is also observable in the reduced diurnal motion of the barometer; as I long since pointed out to be the case in regard to the *Benares* tables published in the Asiatic Researches, vol. XV.

Another material point to be noticed in the plate is the gale of the 3rd of August, when the *Calcutta* barometer dropt down to 28.8 inches passing (on the plate) through the *Tirhút* column, which is only partially affected. There is in all the lines a decided fall at the same period, but only of an ordinary extent, apparently unconnected with the disturbing cause of the *Calcutta* storm. Any who have witnessed the gathering of a north-wester during the calm serenity of a sultry evening, and have watched the turbulence of the clouds and commixture of upper currents prior to the sudden and furious generation of the whirlwind below, will be prepared to consider the hurricanes and gales of longer duration as equally insulated in their origin, only upon a much larger scale of operation. A sudden condensation of aqueous, or perhaps of gaseous matter, whether by electricity or simple cold, would, by drawing upwards toward the vacuous space, the under air, cause a fall in the barometer as certainly as if there were an absolute removal of superincumbent weight, for which there would be no mode of accounting; and this upward current could not take effect without the production of a horizontal current of corresponding degree and velocity.

The last point of instruction to be gained from the present plate,—and it is a very important one,—is the reliance that may be placed on the measurement of barometrical altitudes taken by comparing the observed height at places so distant as *Cawnpore*, or in the mountainous regions of the *Himálayas* with the register of a stationary instrument at *Calcutta*. I confess I always had misgivings on the comparability *inter se* of such distant readings, until as it were my hand refuted the doubts of my mind. The engraving shews that a dozen contemporaneous observations (that is, observations not made at the same instant, but at the same relative hour), would be ample for fixing the altitude of a place within moderate limits. Moreover, it shews that no reference of an observed height to a fixed unit (as 30 inches), as-

sumed as the barometric zero at the level of the sea, can possibly be trusted: hence the advantage of maintaining a constant register at one or several fixed spots; nay, it may be almost regarded as a public desideratum, where, as in India, the Government has so much to learn of the physical geography of its vast territories.

Want of space has prevented my including in the plate the thermometric columns for 1835; but the temperature does not require such minute discussion as the pressure, for obvious reasons. The hygrometrical phenomena also are rather unsuitable to graphic illustration. The monthly averages to which we must now pass will, it is hoped, be sufficiently comprehensive in these departments to cause no regret at the unavoidable suppression of the daily registers.

Beginning, then, with the Bombay and Socotra series we have the following

Abstract of Bombay Observations for part of 1834, *by Mr.* Henderson; *for* 1835, *by Mr.* S. Frazer.

	Barometer uncorrected.			Thermometer.		
	10 A. M.	Noon.	3 P. M.	10 A. M.	Noon.	3 P. M.
1834.						
January, .	30.06	30.03	29.98	76.5	77.5	79.2
February,.	30.03	30.00	29.95	77 2	78.7	80.0
March, ..	30.01	29.97	29.93	79.5	85.5	82.0
	Barometer reduced to 32°.					
1835.						
January, .	29.974	29.939	29.889	.. Sunday Obs. carent.		
February,.	.898	.907	.853	.. ditto.		
March, ..	.875	.837	.788	from 12th to 16th carent.		
April, ...	.890	.851	.790	16 to 20 ditto.		
May, ...	.779	.752	,736	2, 3, 8 to 10 ditto.		
June, ...	.662	.639	.612			
July, ...	.610	.605	.579			
August, ..	.688	.663	.630			
September	.730	.727	.626			
October,..	.823	.786	.729	} 30th Oct. to 3rd Nov. carent		
November,	.985	.941	.900			
December,	.980	.957	.902	from the 25th carent.		
Means, ..	29.824	29.800	29.753			

Mr. Noton, fancying I was only in want of the barometrical series, has omitted to send that of the thermometer or of the weather in general. His own observations for many years on the climate of Bombay are, however, published, and will supply the deficiency when we come to take a general review.

Abstract of Observations taken on the coast of Socotra, on board the H. C. S. Palinurus, H. B. Haines, *Commander, in* 1834.

Month.	Barometer at 32°.			Thermometer.			Wind.	Weather.
	8 A.M.	Noon.	8 P.M.	8 A.M.	Noon.	8 P.M.		
January, .	29.429	29.416	29.414	76.7	80.7	79.4	ENE.	cloudy, 7 days rain.
February,.	.405	.396	.395	77.2	80.5	78.5	ENE.	hazy and squalls.
March, ..	.393	.377	.370	75.5	81.0	80.9	NE.	calms—clear.
June, ...	.093	.087	.077	86.9	91.5	90.0	SW.	hard gales.
July, ...	.089	.082	.082	84.0	87.0	86.2	SW.	hard gales.

The last two months' journal contains also the readings at 4 A. M. sunrise, 3 P. M. and sunset; but necessarily on board a ship in heavy weather, the diurnal oscillations cannot fairly be estimated.

We may now pursue the same course with Mr. Dashwood's tables for *Tirhút*, from December, 1833, (prior to which they have already been inserted,) first only reducing the barometric altitudes to 32°. Mr. Dashwood, following my recommendation of tapping the tube before reading off, has, as I expected, made the daily oscillation considerably greater than in his first register. Thus also my new standard barometer is found to oscillate full a fifth more than the old, so that the real external change of pressure during the day is hitherto only approximately known, and may perhaps be nearer $1\frac{1}{2}$ than 1-tenth of an inch.

Monthly Abstract of Meteorological Observations, kept daily at Mozafferpúr in Tirhút, from the 1*st December*, 1833, *to the* 31*st May*, 1836, *by the late* Thomas Dashwood, *Esq. C. S.*

Month.	Barometer reduced to 32°.		Thermometer in doors.		outside.		Winds Number of days.				Days Rain.	Weather.
	9¾ A M inch.	4½ P M inch.	9¾ A M	4½ P M	Max.	Min.	W.	E.	N.	S.		
1833.			o	o	o	o						
December,..	29.662	29.570	62.0	64.1	70.1	54.8	18	13	0	0	8	fogs and showery.
1834.												
January, ..	29.670	29.572	58.0	61.0	68.5	48.5	20	10	1	0	0	clear, cold.
February, ..	29.620	29.531	64.6	69.2	75.5	56.4	14	12	1	1	1	fair, changing.
March, ...	29.550	29.439	72.6	76.4	85.4	63.7	16	14	1	0	2	W.in day, E.at night.
April, ...	29.470	29.367	77.4	78.6	91.2	69.4	11	18	1	0	0	do. 4 northwesters.
May, ...	29.281	29.195	84.2	85.5	108.6	75.3	0	31	0	0	3	wind strong at night.
June, ...	29.20	29.133	83.7	85.4	95.4	76.8	1	29	0	0	14	Cloudy and squally.
July, ...	29.252	29.167	84.0	85.6	92.3	77.7	0	30	0	0	15	earthquake on 11th.
August, ...	29.280	29.194	83.8	85.4	90.3	77.9	7	21	2		12	changeable.
September,	29.373	29.264	83.5	81.7	89.8	78.0	3	20	0	0	10	fair, earthquake.
October,....	29.525	29.450	79.5	81.0	85.2	74.0	9	9	0	0	10	gale on 4th, wet, fine.
November,..	29.722	29.621	71.5	74.0	73.8	57.7	23	5	2	0	0	fine, clear.
December,..	29.762	29.660	65.1	67.8	70.7	53 6	21	10	0	0	3	hazy, fogs in morn.
1835.												
January,....	29.775	29.687	59.5	63.1	65.5	44.5	22	9	0	0	1	do. clear days.
February, ..	29.761	29.672	65.0	69.6	72.8	52.8	12	15	0	1	4	4 squalls, fine.
March, ...	29.675	29.601	71.5	76.5	85.0	57.7	25	4	0	0	2	cloudy, fair.
April, ...	29.659	29.528	78.4	80.2	93.9	66.6	14	16	0	0	4	frequent squalls.
May, ...	29.472	29.365	82.4	83.7	95.3	74.1	5	26	0	0	4	several storms.
June, ...	29.377	29.306	83.0	84.6	93.9	74.1	0	29	0	1	10	very heavy hail 14th.
July, ...	29.331	29.268	81.9	82.5	88.8	73.9	10	17	1	0	21	constant rain.
August, ...	29.399	29.310	82.8	84.1	88.2	73.1	12	17	1	0	14	3 storms, fair.
September, .	29.494	29.380	81.5	83.6	86.8	71.3	3	25	1	0	6	6 northwesters, fair.
October,....	29.605	29.518	78.1	80.4	82.0	64.8	18	11	2	0	1	light winds, fair.
November,..	29.829	29.741	67.8	71.7	72.4	53.6	16	5	1	0	0	clear, 1 fog.
December,..	29,772	29.671	61.0	64.6	68.4	47.0	13	18	0	0	2	heavy fogs, 1 squall.
1836.												
January,. ..	29.775	29.678	56.8	60.6	65.1	41.4	21	10	0	0	1	natural ice 3 nights.
February, ..	29.697	29.598	61.8	65.5	72.2	48.3	12	17	0	0	6	changeable, fair.
March, ...	29.499	29.393	73.6	77.2	86.5	60.2	7	14	2	0	2	fair, 2 storms.
April, ...	29.409	29.291	78.9	80.4	94.4	66.8	11	15	0	0	1	W. morn, E. night.
May, ...	29.275	29.185	83.3	85.1	97.8	73.5	3	22	0	0	6	clear, squally.
Means, 1833.	29.433	29.348	76.0	79.0	87,0	69.1	132	232	?	?		
Means, 1834.	29.475	29.383	75.6	77.6	85.5	67.4	125	209	8	1	70	The depth of rain
Means, 1835.	29.595	29.503	76.1	77.1	82.6	62.8	150	192	6	2	69	was not noted.
Mean of 3 ys.	29.501	29.411	75.9	77.9	85,4	66.4						
General mean,	29.456		76.9		75.9		$\frac{2}{6}$ W. $\frac{4}{6}$ E.					

The *Tirhút* Barometer had not been compared with my standard.

The *Cawnpore* table needs no particular remark. The daily notices of the weather are very full, but unfortunately there is no possibility of abbreviating them. I have attempted in some measure to meet this difficulty, as in the *Tirhút* tables, by numbering the days of each prevailing wind, and of rain. The predominance of easterly winds strikes me as rather anomalous during the hot season; but I have witnessed the same irregularity at *Benares*. The hot westerly wind is purely a day breeze, and very rarely extends to the night, which is generally calm, or has a light air in the opposite direction.

Abstract of a daily Register of the Weather at Cawnpore, kept by Col. G. Pollock, *C. B. during the years* 1834 *and* 1835.

Month.	10 A. M.			4 P. M.			Wind, days.				Rain days.	
	Barometer. at 32°.	Thermometer. House.	Thermometer. Air.	Barometer. at 32°.	Thermometer. House.	Thermometer. Air.	N.	E.	S.	W.		
1834.	inches											
Jan.....												
Feb. ..	29.693	—	—	—	—	—	—	6	—	8	3	only 15 days observed.
March,	29.50[illegible]	77.1	—	—	—	—	4	12	—	14	1	clear, one storm.
April, ..	29.403	80.0	—	—	—	—	5	9	—	10	3	terrific dust, storm 15th
May, ..	29.217	86.1	—	29.114	86.5	—	—	14	1	15	—	wind chgd. to W. at noon
June, ..	29.129	86.5	90.4	29.045	86.7	94.1	2	18	—	11	7	do. frequent squalls.
July, ..	29.126	84.8	85.2	29.053	85.8	87.0	1	25	—	5	5	a few light showers.
Aug. ..	29.180	84.3	84.6	29.108	86.0	87.1	4	14	1	12	13	wind variable, cloudy.
Sept....	29.271	82.5	82.1	29.189	83.3	83.9	3	20	1	6	17	much rain, cloudy.
Oct.....	29.469	77.5	77.2	29.375	80.5	80.7	10	14	—	7	4	wind strong, 1 storm.
Nov....	29.640	71.2	72.8	29.570	76.3	77.7	3	1	1	8	—	13 days obs. clear.
Dec. ..	—	64.6	64.0	—	69.3	71.0	20	5	1	5	4	clear ; rain at Xtmas.
1835.												
Jan.....	—	59.5	58.1	—	67.7	69.5	6	4	—	2	—	strong winds, cloudless.
Feb.. ..	—	64.0	64 3	—	71.0	74.7	8	6	2	12	2	light clouds, 1 squall.
March,	—	70.7	72.9	—	73.8	81.4	3	8	3	17	3	strong winds & squalls.
April, ..	—	77.8	85.0	—	78.3	92.1	6	10	6	8	9	dust storms, cloudless.
May, ..	—	82.0	93.0	—	81.8	100.0	1	18	3	9	5	unusually hot.
June, ..	29.243	82.8	87.4	29.237	83.5	93.0	2	19	2	7	13	rains begun 16th.
July, ..	29.285	81.8	86.2	29.267	83.3	88.2	1	6	7	17	11	heavy clouds, rain light.
Aug. ..	29.432	82.4	87.6	29.360	83.4	90.3	3	13	4	11	14	much rain, cloudy.
Sept....	29.543	81.0	95.5	29.445	81.7	88.6	9	15	1	5	8	cleared on the 25th.
Oct.....	—	—	—	—	—	—	—	—	—	—	—	
Nov.	29.656			29.573								Col. Pollock's Barom.
	.922	69.7		.850	74.8							Dr. Dempster's do.
	.870			.751								Mr. Campbell's do.
Dec. (9 dys.)	.676			.87								Col. Pollock's do.
	.955	64.6		.70	70.0							Dr. Dempster's do.
	.898			.782								Mr. Campbell's do.

The error of Colonel Pollock's instrument when compared with my standard in April, 1835, was only —.059. It is difficult therefore to account for its standing so much lower than Dr. Dempster's, and Mr. Campbell's, unless some accident happened to it on its return to Cawnpore.

The *Bancoora* series, being limited to two months, will not admit of an abstract; we may therefore pass to the *Nipal* tables.

Abstract of Daily Barometrical Observations, made at Katmandhu in Nepál, by Capt. G. H Robinson.

Months.	Mean height of Barometer reduced to 32° for the hours													Maxima.	Minima.	Daily Range.
	A.M. 7	8	10	11	12	P.M. 1	2	3	4	5	6	7	8			
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.			in.
1833.																
July, ...	..	..	..	..	..	..	..	..	..	..	..	..	..	25.126	.062	.063
Aug.....	..	..	..	..	..	..	..	..	..	..	..	..	..	.148	.088	.060
Sept.	..	..	..	..	..	..	..	..	..	..	..	..	..	.225	.153	.064
1834.																
July, ...	25.168	.176	..	.162	.144	.121	.101	..	.070	.073	.119	..	.129	..	..	.088
Aug.....	.171	.185	..	.168	.159	.127	.109	..	.096	.101	.053	..	.154	..	..	.074
Sept.	.257	.270	..	.259	..	.206	.168	..	.161	.174	.233	..	.159	..	..	.109
Oct.....	.325	.344	..	.333	.310	.279	..	.235	.233	.240	..	.264	..	..	..	.111
Nov.	.413	.440	..	435	.423	.328	..	.328	.354	..	..	.381	..	..	..	.086
1835.																
April,.. ..	.401	..	..	..	.395	..	.355	..	.317	..	..	.341	.	.399	.323	.074
May, ...	.305	..	..	..	.292	.	.250	..	.221	..	..	*.240	..	.301	.220	.071
June,.....	.198	..	..	..	.170	..	*.125	..	*.114	..	..	*.147	..	.288	.112	.073
July, ...	*.142	..	.149	..	,125	..	*.184	..	*.073	..	..	*.102	..	.149	.072	.074
Aug.....	*.233	..	.240	..	.219	..	*.169	..	*.153	..	..	*.178	..	. 87	.108	.078
Sept.	*.315	..	.320	..	.289	..	*.238	..	.218	..	..	*.238	..	.319	.217	.093
Oct.....	*.084	..	.407	..	.367	..	.313	..	.295	..	..	.305	..	.392	.291	.092
Nov.	*.512	..	.541	..	.499	..	.450	..	.425	..	..	.444	..	.539	.428	.098
Dec.....	*.457	..	.493	..	.449	..	.390	..	.383	..	..	.417	..	.493	.376	.113

Abstract of Thermometrical Observations, made simultaneously with the above.

Months.	Thermometer inside the house.										Thermometer outside.					Rain.
	A .M. 7	8	10	11	12	P.M. 1	2	4	5	6	8	A. 7	M. 10	12	P. 2	M. 4	
1833.																	
July, .	75.2	..	..	..	..	..	79.2	..	..	..	..	69.3	..	..	84.6	..	9,517
Aug...	73.9	..	..	..	..	..	76.7	..	..	..	.	69.6	..	..	81.8	..	13,720
Sept. .	73.4	..	..	..	..	..	77.1	..	..	..	..	67.9	..	..	78.5	..	3,822
1834.																	
July, .	74.6	75.4	..	76.8	77.4	77.9	78.3	77.9	77.7	77.2	77.0	..	..	..	..	..	14,436
Aug...	73.7	74.5	..	76.3	74.0	77.8	78.0	77 4	76.7	76.9	76.3	..	..	..	..	..	12,380
Sept. .	73.3	73.9	..	76.3	..	77.9	78.3	78.1	77.3	75.3	77.6	..	..	..	..	..	11,292
Oct...	66.2	66.2	..	69.2	69.8	70.2	70.7	7 .4	71.3	70.2	..	..	..	..	..	..	9.930
Nov. .	60.0	61.7	..	63.1	63.0	66.1	..	65.0	..	65.2	..	..	..	..	..	..	1,280
1835.																	
April,.	64.1	..	..	..	67.7	..	67.7	68.5	..	..	..	54.7	..	72.8	74.3	71.8	4,352
May, .	69.3	..	..	..	71.3	..	73.2	74.2	..	..	..	62.9	..	77.1	78.0	77.1	4,207
June,.	73.3	..	..	..	75.3	..	*76.2	*76.4	..	..	..	69.3	..	80.3	79.9	*76.9	7,941
July, .	*73.8	..	75.2	..	75.7	..	76.7	*76.4	..	..	..	*73.4	77.6	81.0	79.5	*74.5	14,677
Aug...	*73.0	..	74.2	..	75.2	..	*76.5	*76.0	..	..	..	*69.0	76.1	79.8	*79.6	*74.9	12,891
Sept. .	*71.4	..	72.8	..	74.1	..	75.5	75.6	..	..	..	66.6	74.0	76.1	76.1	74.0	4,416
Oct...	*64.0	..	65.8	..	67.6	..	69.7	70.8	..	..	..	*55.0	64.7	68.8	71.1	70.6	1.608
Nov. .	*55.4	..	56.5	..	58.4	..	60.3	61.5	..	..	..	*40.5	50.7	58.4	63.7	60.8	0,063
Dec...	*50.6	..	50.8	..	51.8	..	53.3	54.5	..	..	..	*34.5	41.9	49.3	54.4	54.1	1,211

The items marked with an asterisk were taken half an hour later than the hour indicated at the top of the column.

In July, August and September, 1833, the register notes only the minima and maxima temperatures, but to save room I have supposed these to accord with the hours of 7 A. M. and 2 P. M.

Of the two barometers registered at *Katmandhu*, that of the Resident has been preferred, for 1834. Capt. Robinson's tube for that year stood a quarter of an inch lower, and was hardly sensible to the diurnal oscillation. After boiling it in the month of September, however, it rose to within .02 of H.'s, and exceeded the latter in oscillation by .03. This and the circumstance of the hour of maximum 9 to 10 A. M. being unfortunately omitted among the numerous periods of the day selected for register, render not only the absolute amount of diurnal motion still uncertain for *Nipál*, but also prevent our calculating the annual average. I hope the series I am now promised by Dr. A. Campbell for 1837 will supply the want.

I reserve for a separate notice the calculated elevations connected with the *Nipál* series, as they are affected by the error alluded to in the preceding remarks, of assuming 30 inches for the barometric zero at the level of the sea.

The state of the wind in the valley has not been noted, but the fall of rain is recorded with precision, the average amount being about 50 inches.

The series for *Simla* does not comprehend an entire year, and will not therefore furnish averages. The temperature appears to be that of the interior of the house.

Abstract of Meteorological Register kept at Simla, from the 15th May to the 21st November, 1834. *By* S. M. Boulderson, *Esq.*

Month.	Barometer at 32°.			Day tide.	Thermometer.		
	10 A. M.	4 P. M.	10 P. M.		10 A. M.	4 P. M.	10 P. M.
May, ...	23.816	.773	.802	.033	74.0	74.5	73.9
June, ...	.784	.723	.774	.061	70.8	70.6	69.2
July, ...	.794	.729	.784	.065	67.4	67.6	66.9
August, ...	.827	.777	.803	.050	68.5	67.9	65.9
September, ...	.908	.832	.872	.076	67.2	66.0	65.4
October, ...	24.013	.942	978	.071	62.6	62.7	58.2
November, ...	.092	.041	.073	.051	57.1	57.5	54.1

The range at 7½ A. M. is also given for the month of May, the mean of the barometer being 23.798; which proves the regularity of the nocturnal tide in these elevated regions.

I must, for want of time, leave to a future opportunity the further analysis of the above tables, and the deduction of general average results from the *Calcutta* tables for the past five years. Meantime, I will conclude with the insertion of a table of the temperature at *Kandy* in *Ceylon*, obligingly contributed by Captain Ord, R. E., and a note on the temperature of the *Brahmaputra* in *Assam*, compared with that of the air at the same time by Dr. W. Griffith.

Extract from a Meteorological Journal kept at Kandy, Island of Ceylon, by Captain Ord, *R. E.*

(To complete the year 1834, broken off in the Extract published in Journal, No. 48, December 1835, page 709.)

Date.	Thermometric Range.							Rain-guage.	
1834.	Monthly Range.		Greatest Range in 24 hours.		Least Range in 24 hours.		Mean. Temp.	Rain fallen.	Fallen in 24 hours
Month.	Max. and Min.	Range.	Max. and Min.	Range.	Max. and Min.	Range.		In the month. inches.	Max. and Min.
Nov....	81½ / 63½	18	81 / 63½	17½	67 / 65	2	72	30.6	9. 0 / 0
Dec. ..	84 / 57	27	76½ / 57	19½	68½ / 67½	1	70½	4.6	3. 3 / 0

N. B. Highest range in the shade during the year 1834, 88°, lowest 57°, mean temp. 73° 1.

Total quantity of rain fallen during the year, 96.7 inches.

Extract from the same Journal for the year 1835.

Date.	Thermometric Range.							Rain-guage.	
1835.	Monthly Range.		Greatest Range in 24 hours.		Least Range in 24 hours.		Mean Temp.	Rain fallen.	Fallen in 24 hours.
Month.	Max. and Min.	Range.	Max. and Min.	Range.	Max. and Min.	Range.		In the month inches	Max. and Min.
Jan.....	79 / 58½	20½	78½ / 59	19½	72 / 67½	4½	70	8·65	0 7 / 0
Feb.....	85 / 60	25	84 / 62½	21½	78 / 70	8	72¾	0·7	0 7 / 0
March,	84½ / 58½	26	84 / 62½	21½	78 / 70	8	73¼	5·4	2 8 / 0
April, ..	82 / 65½	16½	82 / 66½	15½	78 / 70	8	74	6·2	2 3 / 0
May, ..	83½ / 65	18½	81 / 65	16	76 / 71	5	73¾	3	0 5 / 0
June, ..	80½ / 66	14½	80½ / 66	14½	75 / 70	5	72⅔	4·8	0 8 / 0
July, ..	83 / 64	19	81 / 64	17	75 / 70	5	72¾	2·7	0 7 / 0
Aug. ..	83½ / 64	19½	80 / 64	16	74 / 70	4	72⅔	5·8	0 9 / 0
Sept. .	84½ / 65	19½	84½ / 66	18½	73½ / 69½	4	72	7·15	1 8 / 0
Oct. ..	82 / 65	17	82 / 65	17	70 / 79	1	71	20·6	6 0 / 0
Nov. ..	85 / 54	31	83 / 54	29	76 / 69	7	72	6·8	1 2 / 0
Dec. ..	85 / 62	23	84 / 62	22	78 / 69	9	72½	4·4	1 5 / 0

N. B. Highest range in the shade during the year 1835, 85°, lowest, 58½°, mean temp..... 72·44

Mean of max. and min. for the 2 years, ... 72·125

Ditto of calculated mean temp. for ditto, ... 72·77

(Too high, in consequence of employing the hours of 8 instead of 10.)

Total quantity of rain fallen during the year, 76·2 inches.

September, 1836.	6 A. M. Air. In House.	6 A. M. Air. Over Kundeel.	6 A. M. Air. Over Burrumpootur.	6 A. M. Water. Of Burhumpootur.	6 A. M. Water. Of Kundeel*.		2 P. M. Air. In House.	2 P. M. Air. Over Kundeel.	2 P. M. Air. Over Burhumpootur.	2 P. M. Water. Of Burhumpootur.	2 P. M. Water. Of Kundeel.	6 P. M. Air. In House.	6 P. M. Air. Over Kundeel.	6 P. M. Air. Over Burhumpootur.	6 P. M. Water. Of Burhumpootur.	6 P. M. Water. Of Kundeel.	
1	0	0	0	0	0		65	102	100	64	77	83	82½	82	66	79	
2	0	0	0	0	0		76¼	76	75	64	76	76¼	76¼	73	64	75¾	Light fog over B.
3	75	75	68¼	63	73½		63	85	77¾	66	75	82	81	67	66	76	
4	77	77	69¾	64	75		83½	86	78	65½	77½	83	81¾	70	66	77	
5	76	76	69	64	75	Partial fogs over Burhumpootur.	82	93	82	65½	77½	85	85	70	66¾	77	
6	0	0	0	0	0		75	76	75¾	65	76	76	76	70¼	65	76	River B. rising considerably.
7	74	74	68	63½	73¾	Slight and partial fogs over do.	84	86	77¾	65	77	82	80	69¾	65	77¼	
8	76	74	72	64	75¾	Burhumpootur risen two feet.	87	88½	86	67	80¼	0	83¾	74	68	80	
9	74	74	74	67	76		85	87½	86	69	80	83	83	74	69	80	
10	77	76	72	67	77	Slight fogs over Burhumpootur.	86	86	84¼	68	79	0	0	0	0	0	
11	76	76	73	68	77	Partial fogs over do.	82	86½	80¼	69	79	80	81	74¼	69½	78	
12	76½	77	72½	68	76	River falling.	83	86	82	68	78	0	0	0	0	0	
13	77	76½	75	67	75½		85½	90	84	69	79	83	81½	76	69	78	
14	76	76½	80	66	74½	General fog over do.	86	84	86	69	80	83	83	74	70	80	
15	77	76	72	68	76		87	91½	85½	70	80	86½	82½	75½	70	80	
16	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	
17	76	76	70	67	76½	Slight fog over do. *Considerable*	87	92	82	69	81	0	0	0	0	0	
18	79	77½	72	67	77	*rise.*	88½	94	92	69	81½	87½	86	79	70	81½	
19	74	74	72	67	76¼		83	87	80	68	80	0	0	0	0	0	
20	76	75	71	66½	75½	General fog : thickest over B.	84	86½	83	69	79	0	76¼	74	68	78	
21	76¼	76	71½	67	76		78	80½	79	68	76¾	77½	76	72½	68	76¼	
22	74	75	76½	66	74	Rise in Burhumpootur of 2 feet.	84½	85	84	68	77½	0	0	0	0	0	
23	73	75	74½	66	75	Fall of Burhumpootur, slight fog	85	89	86	68	80	83	82	74½	68	79½	
24	76½	75	71	67	76	over do.	86	92	84	69	80	86	82½	73½	69	80	
25	74½	74	69½	67	76		85½	91	87	69	80	86	82	73½	69	80	
26	72½	72	74	67	76		86½	91	85	69½	80	86	83½	73	68½	80	
27	0	0	0	0	0		0	0	0	0	0	86½	82½	76	68¾	80	
28	76	75	72	67	75½		0	0	0	0	0	84	82	74	68	78	
29	0	0	0	0	0		0	0	0	0	0	82	79	77	67	77	
30	75½	75	69	65½	74½		83	84	83	67	77½	82½	80	75	67	77	

* The Kundeel is a small nullah joining the Burhumpootur at Sadiyá.

Taken with a Thermometer, graduated in scales of 2 degrees each; the instrument was nearly immersed in the water. The temperatures of both rivers are taken some distance from the banks of the Burhumpootur at about 40 yards. Scarcely any difference, however, is to be found between the temperature at some distance out and that near the banks.

XIV.—*Postscript to the Memoir on the Depression of the Wet-bulb Thermometer, published in the July number. By* Jas. Prinsep, *Sec. &c.*

I have only found leisure to repeat the experiments forming the final section of my former paper, on one more of the simple gases, namely oxygen; of which the specific heat, calculated from the data thus supplied, has not been found to differ materially from that of common atmospherical air. It follows necessarily, that azote must have the same specific heat, since the mixture of the two causes no alteration in the observed depression. The experiments were conducted in the same order as before, except that the glass exit tube was somewhat narrower, and the dry thermometer was fixed in it half an inch below the wetted bulb. Some trials, with common air, were first made to ascertain whether this arrangement produced any material difference of result.

Depressions with Oxygen gas.

	Bar.	t	t'	d	h	Max. dep. for hyg.	Tabular max. dep.
		°	°	°			
Sept. 21 Common air,	29.65	92.0	55.0	36.8	6 ?	39.0	37.2
Oct. 2 Ditto,	29.78	83.8	51.6	32.4	0	32.4	32.7
4 Ditto,	29.75	89.5	54.3	35.2	0	35,2	35,7
11 Oxygen,	29.81	82.0	51.4	30.6	2	31.2	31.8
21 Ditto,	30.00	81.2	53.4	27.8	2 ?	28.3	31.4
Nov. 3 Ditto,	29.90	82.8	52.1	30.7	0	30.7	32.1
5 Ditto,	29.88	83.4	52.2	31.2	0	31.2	32.5

In the first experiment it is evident, that the hair hygrometer had not reached its full contraction for the actual siccity of the air enclosed in the gasometer. The trifling inferiority in the depressions for oxygen, I am inclined to attribute to the more sparing hand with which it was expended:—the difference of four per cent. is certainly larger than ought to be conceded to experimental error, but I feel sure that a more careful and longer series would have brought out a nearer approach to the depressions observed in common air.

XV.—*Proceedings of the Asiatic Society.*

Wednesday Evening, the 4th January, 1837.

The Honorable Sir Edward Ryan, President, in the chair.

Messrs. W. Dent and M. Manuk, proposed at the last meeting, were ballotted for, and duly elected Members of the Society.

Captain Edward Sanders was proposed by Major Taylor, seconded by Mr. W. H. Macnaghten.

Mr. John Curnin was proposed by the Secretary, seconded by Mr. Bagshaw.

Captain F. Jenkins, proposed by the Secretary, seconded by Sir E. Ryan.

Mr. George Hill, proposed by Dr. Pearson, seconded by the Secretary.

Mr. Richard Walker, proposed by Mr. Bell, seconded by the President.

Bábus Ra'mna'th Tagore and Prasannakuma'r Tagore, proposed by Bábu Rusomov Dutt, seconded by the Secretary.

Mr. P. A. Lair was proposed a corresponding member by Mr. James Prinsep; the nomination was referred to the Committee of Papers.

The meeting then proceeded to the annual election of office-bearers, when the following gentlemen were elected.

Vice-Presidents.

Sir John P. Grant, Sir B. H. Malkin, the Rev. Dr. Mill, W. H. Macnaghten, Esq., H. T. Prinsep, Esq.

Committee of Papers.

J. R. Colvin, Esq., C. E. Trevelyan, Esq., Capt. Pemberton, Capt. Forbes, D. Hare, Esq., J. T. Pearson, Esq., Dr. Wallich, Capt. Cunningham, Ramcomul Sen.

The Secretary read minutes from the Report of the Committee of papers on the Honorable Mr. Turnour's proposed publication of the *Mahávansi.*

Minute by Dr. Mill.

In presenting to the world both the text and the translation of these extensive historical works—and in thus rescuing them from what is in many respects worse than total oblivion, the confusion and misapprehension of their real testimony which a former very erroneous publication on the subject in England was calculated to produce,—Mr. Turnour would have conferred a very great benefit on the historical literature of the East, had his merits even stopped at this point, and had he not further shewn by his comments, how admirably qualified he is to illustrate the work he edites, and enable every reader to profit by its contents. The literary benefit is very far from being confined to the single subject of Ceylon: it extends to the whole of India: and yields in importance to nothing that has yet been produced on that most perplexed and generally unproductive subject, the history of India prior to the thousandth year of our era.

How these documents bear on the general history of the country, will be very evident to any one who follows the able editor in his preliminary remarks, as well as in the specimen he has already given us of the first book of his series, the *Mahávansi.* It is enough to remark, that the peculiarly interesting connexion between the history of *Ceylon* before the Christian era, with that of *Magadha*, or that part of Northern India which we now call *Behar*, is attested by the

very language* in which all these books are written: and that it originates with what is undoubtedly the most striking and important moral phenomena in the history of *Eastern* Asia, the rise of Buddhism from the centre of that great Gangetic kingdom. And it is observable, that the same dynasty of sovereigns of that large district, reigning at *Pataliputra*, or *Palibothra*, the present *Patna*, —from the midst of whom Gautama Buddha arose nearly six centuries before our Lord,—presents us not two centuries afterwards, in the age of Alexander and Sandracottus with the one solitary point in which the history of India

* The *Páli* in which these historical books are written, and which is the language of Buddhist literature and religion, as well in *Siam*, *Ava*, *Nipál*, and *Tibet*, as in *Ceylon*,—is in fact no other, as Mr. Turnour shews, and the text of his originals exhibits to every Sanscrit scholar, than the *Magadha Pracrit*,—the classical form in ancient *Behar*, of that very peculiar modification of Sanscrit speech which enters as largely into the drama of the Hindus (though in a different way) as did the Doric dialect into the Attic tragedy in ancient *Greece*. Now, all the variations of Sanscrit words that occur in these Pracrit dialects, answer closely to the forms which the same words exhibit in the vernacular Hindui of that province, and the yet more northern districts of India, as far as the Himálaya: (e. g. the omission of the *r*, the changing of *bh* to *h*, &c. &c.) and are totally unlike the forms of the same words even in the province of *Bengal*, or as infused into the languages of the Southern peninsula, and of *Ceylon* itself. And whenever corresponding words in the *Páli* and *Singhalese* occur, as they do every where, I believe it will be invariably found that the *latter*, (the vernacular words of the people of the Kandian and maritime provinces of *Ceylon,) resemble most closely* the Sanscrit original of both:—whereas the former, the sacred language, takes in all words that admit of it, the same sort of peculiar variation which belongs to the tongues of northernmost India,—shewing evidently that it was *thence*, and not from *Ceylon*, that the peculiar language as well as institutions of Buddhism came to the island,—as the *Mahávansi* itself distinctly asserts. To take but one out of the many instances that might be alleged, we may give one of the most remarkable and early names of the island, viz *Tamba-pannyo*, as the Páli name is given in p. 35 of this specimen of the *Mahávansi*, viz. the "copper-palmed;" in Sanscrit *Tamra-páni*. Now this Sanscrit form, so different from the Pali, is actually the present Singhalese for the same thing, as I was assured by a competent scholar on the island: and a very convincing proof that it has ever been so, may be seen in the name by which the island was universally known to the ancients and to Cosmas Indicopleustes when he visited it, viz. *ταπροβανη*. The Greeks would be just as unlikely to introduce this *r* where it did not exist, as any other languages of India beside the northernmost ones would be to drop it where it before existed: but this is a universal character of the Pracrit and of the present Hindui, (as seen in this word, *tamba*, copper—*kám* "work" for *karm*, &c. &c. &c.)

This real origin of the celebrated name *Taprobane* (whatever may be thought of the story connected with it in the *Mahávansi*, and which may seem with greater probability to have arisen from the *tamra-varna*, or *copper colour*, of its southern cliffs near *Matura*, so well known to navigators)—is one of the points of curious and interesting information which we owe mainly to this publication of Mr. Turnour. Whatever had been before suggested as the probable origin of that name, so little now known except in these Buddhistic books, as one of the proper names of the great island of *Lanca* or *Singhala-dwipa*, was in the highest degree forced and improbable, (ex. gr. the Hindví *Tápú-Raban*, or the island of Rávana.)

coincides with that of Western Asia and Europe, from which in every other point (before the Mahometan conquest) it is so remarkably and totally separate.

The great value of these works, as containing correct chronological history, is well established from this unerring test by Mr. Turnour. And he most ably vindicates the Buddhist authors of *Ceylon* at least, from the general censure passed on them by Professor Horace Wilson,—in reviewing the Tibet documents of M. Csoma Körösi,—of being, if possible, more regardless of chronology than even the Bráhmans. The degree of accuracy, indeed, with which, in the midst of this long series of kings, the age of Chandra-Gupta Maurya is marked,—even admitting an error of sixty years from his proper age, as a contemporary of Alexander and Seleucus,—is yet most wonderful, when compared with the only other chronological Indian history yet produced—the history of *Cashmír*, called the *Rája Taranginí*, (which we owe to the eminently learned orientalist just named,) whose lists would go to antedate that celebrated king by nearly twelve centuries.—On all these points, Mr. Turnour's observations are very valuable: and even when they may fail to produce conviction (as in some parts of the dissertation inserted in the Journal As. Soc. of September last), the learning and candour with which he prosecutes the inquiry, and the absence of all undue prepossession in favor of those authors with whom he is necessarily most conversant, ever entitle them to the utmost consideration.

It would be undervaluing these works to suppose them to be merely a dry chronological catalogue of sovereigns and dynasties: though this is frequently all that an inquirer into ancient India is able to meet with; where, between fable on the one hand, and the strong national tendency to abstract speculation on the other, the literature of the country has so little to aid a *historical* student. These works apparently contain much that may well be deemed valuable by a philosophical inquirer into history: and the details, in particular, of the contest between the antagonist principles of Bráhmanism and Buddhism, are often curiously illustrative of the genius of these two systems, which have held, and still hold, such sway over large portions of mankind.

W. H. Mill.

Minute by the Secretary.

Fully subscribing to the eulogy recorded by our Vice-President on Mr. Turnour's labours, which all who have read his specimen-volume and preliminary treatise will acknowledge to be most just and well deserved, I have merely to notice, that the typographical execution of his Pálí text in Roman character has been examined by a competent native scholar residing in *Calcutta*, and found to contain but a trifling list of errors, and those chiefly of the accented letters. There are blanks in the manuscript which it might be possible to restore by collation with the copies of the *Mahávansí* in the Burmese character, easily procurable at *Ava*. I have sent the specimen to Colonel H. Burney, who will, doubtless, be happy to contribute his collateral aid to this meritorious undertaking.

An opportunity has lately fallen in my way of verifying a portion not of the great Pálí History, but of its Singhalese continuation translated in Mr. Turnour's Tabular Epitome of Ceylon Dynasties. Captain Ord having lately

called my attention to the form of a letter* on one of the ancient coins of Dambadinna hitherto but imperfectly decyphered, at the moment when I was transcribing a *Delhí* inscription of the eleventh century; the form of other letters struck me as very similar to that type, and hence, on re-examining all the coins I possessed, and the drawings of others sent me by Captain Ord, I was forthwith enabled to recognise the names of no less than six kings, all occurring in Mr. Turnour's list within the two centuries immediately subsequent to the *Sholian* conquest†, and thus forming a chronological link with one of the dynasties of Southern India, which has been but very imperfectly lifted from obscurity by the researches of Colonel Mackenzie and others in India proper.

J. Prinsep.

The Society concurring entirely in the Committee's view of the value of Mr. Turnour's intended publication, particularly in regard to the light it throws on the early history of India, it was resolved to advocate its patronage by the Government of India, to the fullest extent that it may have been usual for Government to subscribe to private enterprizes of similar importance in India itself.

Library.

The following books were presented.

Catalogue of 7385 Stars, chiefly in the southern hemisphere, by Mr. W. Richardson—*presented by the Lords of the Admiralty.*

Memoires de l'Academie Royale de Caen, 1825—1829.

Annuaire du Calvados for 1833-34-35, 3 vols.

Essai sur les Combustions Humaines, par Pierre-Aimé Lair, 1 vol. (3 copies) and various tracts, essays, notices, by Mr. Lair and other Members—*presented by the Royal Society of Caen.*

Memoires sur La Conformité Organique dans L'Echelle Animale par Ant. Duges—*presented by Mons. J. C. Villaire, Surgeon of the French Corvette Aube.*

Ward on the Hindus, 2 vols. (purchased.)

Extract of a letter from Dr. Walne to Captain Crawfurd (recently arrived from *Egypt*) was read, expressing a desire to place the Literary and Antiquarian Society at *Caïro*, instituted by himself, in correspondence with the Asiatic Society of Bengal.

The Secretary stated that he had opened the desired intercourse by addressing to Dr. Walne copies of the Arabic works printed by the Society, and of the Ethiopian inscriptions printed in the Journal, in hopes of their being decyphered.

Museum.

A variety of specimens of Native ornaments were presented by Bábu Herambana'th Tha'kur.

* The first letter of the 3rd line in the coin fig. 22 of Pl. L., in vol. iv. which was read *tr*, but ought to be *h*, being joined on the left and open on the right.

† Srí Vijaya Vahu 1071, Srí Parákrama Vahu 1153, Srí rája Lilavatí 1197, Srí Krithi Nikanga 1187, Srí mat Sahása Malla 1200, and Srí Lokèswara 1210.

Physical.

Extracts of letters from Lieutenant G. Fulljames and Captain A. Burnes were read, announcing the dispatch of further fossils from *Perim*, in the gulph of *Cambay*.

Mr. H. Walters presented a very large fragment of a fossil tree from *Bírbhúm*, upon which there appeared a cut as of a hatchet, made before the wood was petrified. (?)

A letter was read from M. Jules Desjardins, dated Maurice 29th September, 1836, forwarding meteorological observations made from April to August inclusive, and promising to continue the series if acceptable.

A note from Dr. Spilsbury explained that the large fossil acetabulum of the elephant, presented at a former meeting, was not found at *Segouní*, (whence the femur of 1834 was extracted,) but from the hill close to *Jabalpur*, which Captain Sleeman first brought to notice. The positions, therefore, of these large fragments were 60 miles asunder.

Another fragment on a still more gigantic scale, the lower end of the humerus, was now presented: and Dr. S. announces three more large fossils on their way to *Calcutta*, from two spots visited by Major Ouseley.

The skeleton of the *Sumatran* Orang-otang which lately died in Calcutta (wanting the hands and feet) was presented by Mr. R. W. Frith.

A large ostraceous shell was presented by the Rev. M. Hill.

The Secretary read his Report on the past year's proceedings, of which the following is the substance.

The number of new Members added to the list in 1836 had been

Ordinary Members,	24
Associate Members,	2
Honorary Member,	1
The loss by death, 2; by departure to Europe, 1; and withdrawal, 3; in all	6

The financial operations of the year were as follows:

Payments.

To house establishment and contingencies, from December, 1835, to October, 1836,	2969	11	5
To salary of the Curator, and museum contingent, from December, 1835, to 30th November, 1836,	2591	14	0
To copies of the Journal supplied to the Members to 31st December,	1088	0	0
To Sheriff and Co.'s bill for repairs,	311	11	8
To matting the hall and part of the museum with ratan,	155	3	6
To new almirahs, shelves, tables, &c.	533	11	4
	187	9	6
To Orphan Press bill for printing 1st part, 20th vol., including authors' copies, &c.	1871	13	4
To lithography and printing plates of Physical volume xix.	524	12	9
To freight to Madras, &c.	17	1	0
Total,	10,251	8	6

Outstanding Bills due.

For the XIXth vol. 1st part, with authors' extra copies,	1646	8	8
For Journal supplied to Members,	1284	0	0
Establishment, Curator, &c. 2 months,	1150	0	0

Receipts.

By balance of past year's account, Sa. Rs. 380 15 2, or	406	5	6
By quarterly collections and admission fees realised,	6551	9	9
By 3rd Dividend on the Estate of Mackintosh and Co.,	382	13	7
By Government for establishment retained by the Society for keeping in custody the Oriental books transferred from the College of Fort William, from April to November, 1836, at 78 per month,	624	0	0
By Interest on Government Securities deposited with the Government Agent,	2093	0	4
By balance in deficit,	193	11	4
Total,	10,251	8	6

Contributions due.

3rd Quarterly Subs. to Sept.	1705	1	5
4th Ditto —— to Dec.	1280	0	0

Oriental Publications.

Payments.

To paid several bills for printing Sanscrit and Arabic,	.. ..	6900	8 6
To Pandits and Maulavís for correcting press,	.. .. ..	160	0 0
To writer and cashier,	.. ..	150	0 0
To expense of removing College Library, and sundries,	..	18	10 6
To purchase of four book cases from the Education Committee,	..	59	11 8
To cash realised by sale of Inaya, transferred to Ramdhan Sen, on his engaging to complete the work,		300	0 0
To freight to Europe, packing, &c.,		192	15 7
To postage, cooly hire, &c.	..	55	9 3
To balance in hand,	.. ..	2174	8 7
	Co.'s Rs.	10,012	0 1
Outstanding Bills due to the end of 1836,	.. ..	2204	9 11

Receipts.

By cash balance of last year,	..	118	10 2
By amount realised from public subscriptions to the Alamgirí,	..	5786	10 8
By private subscriptions for that and other works realised,	..	2909	2 3
By sale of books,	.. ..	615	8 7
By ditto to Education Committee,	..	504	0 0
By establishment for care of books allowed by Government for March, (afterwards entered in general account,)	.. .. ..	78	0 0
	Co.'s Rs.	10,012	0 1
Subscriptions to be realised for works delivered, say,	.. ..	1000	0 0

"The publications by the Society and under its auspices have been this year unprecedentedly numerous. Of the Researches, two half volumes have been completed, one literary and one physical: the latter containing no less than 21 plates. Thirty, indeed, have been engraved, but nine are necessarily kept back, from the text being yet unfinished. It is my duty to bring to the notice of Members in what manner I have been enabled to publish so many finished plates, engraved in a style much superior to those of former volumes, without entailing an expense much beyond that of the paper on which they are printed.

"The lithographs of the snakes and some of the botanical plates were kindly drawn by Dr. Cantor; the remainder of the latter by the artists of Dr. Wallich's establishment: one or two have also been executed by myself: but by far the greater portion, including nine mezzotinto and six line engravings, have been executed on holidays and at early leisure hours, by Ka'sina'th, the chief die engraver of the Mint, who most liberally refuses to accept any remuneration for them, considering himself under some little obligation to the Society and to myself for having brought his talents to notice. I trust the Society will testify in an appropriate manner their acknowledgment of such a disinterested and noble act.

"Besides these works, the Society has witnessed in the course of the past year, the completion of the Fatawa Alamgírí, the second volume of the Mahábhárata, (of which the third volume is also far advanced,) the Rája Tarangíní, the Susrúta, the Naishadha, and the Anis ul Musharrahín, leaving only the remainder of the Mahábhárata and a few pages of the Khazanat ul Ilm, to be accomplished, of all the works transferred from the Committee of Public Instruction*.

"Collaterally the Society has taken under its auspices the publication of the Cochin-Chinese Dictionary, of the Alif Leila, and of an Anglo-Burmese Dictionary of which the manuscript ordered to be printed under the patronage of Government, has been placed in my hands by Mr. Lane its compiler, on his departure for England; meantime our representative in England, Professor Wilson, is engaged in passing the Moorcroft journals through the press at the risk and credit of the Society.

"In this sketch I do not allude to the journal and the appendices published therewith, although it must be well known to all that this work owes its principal and most valuable contributions to its acknowledged connection with the Society.

"In reference to the expectation held out in last year's report, the Government

* The Inaya has been transferred to the Editor, Bábu Ra'mdhan Sen, under agreement that he should complete it.

has, in the course of the present year, transferred to the Society the two branches of the Oriental Library of Fort William, manuscripts and printed works, and has liberally granted a monthly allowance for their preservation. Further donations of a valuable nature have been made by the French Government; the Lords of the Admiralty, the Commissioners of Parliamentary Records, (through the Government,) and by Dr. LUMQUA and other private individuals, in addition to the customary tribute from the learned Societies of Europe and America.

"The Museum has continued to increase rapidly; but its means of doing justice to objects presented has been limited for want of funds. The fossils particularly require more cabinets and more space. Captain CUNNINGHAM'S present of Sárnáth sculptures forms the chief object of notice in the antiquarian museum. Depredations to an unfortunate extent have been lately made by some of the servants of the house, in articles ornamented in silver and gold; which the Librarian partly attributes to the opening of the rooms at so early an hour. Inquiry is now pending at the police, and measures must be devised for better securing our increasing property.

"Some propositions have to be submitted for the publication of further oriental works—but the first to which I would beg the Society's attention are the catalogues of the College manuscripts which have been prepared for the purpose by the Pandit and Maulaví in their respective languages. To the former of these I would recommend that Mr. HODGSON'S revised catalogue of Buddhist works extant in *Nipál* should be added.

"There are in the Society's portfolios a considerable number of original drawings and inscriptions, (besides several bound MS. volumes of the MACKENZIE drawings) which it would be extremely desirable to publish at the present time, when an effort seems to be simultaneously making in India and in Europe to read the history of ancient India through the medium of her monumental records. The Ceylon portion would serve to illustrate the great work upon which Mr. TURNOUR is engaged; while those of the peninsula would form an appropriate appendix to the review of the MACKENZIE MSS. at Madras, which the Society has recommended to be undertaken by Mr. TAYLOR. Were a single competent native draughtsman added to the Government Lithographic Establishment, this object might be attained at a comparatively trifling cost: and I think it would be worthy the Committee of Papers to suggest some measure of the sort to the present Ruler of India, who has accepted, not as an idle honor, the high post of Patron to our Society.

"The last act of the past year has been the establishment of a Committee for statistical inquiries, of the success of which it is yet too early to speak, but not too early to augur well from the known zeal of those who have undertaken the Herculean task."

An application signed by all the students of the Sanscrit College, for the Society to print the *Magh kávya* (of which the edition published by Mr. COLEBROOKE some years ago is now extinct) was referred to the Committee of Papers.

The same measure was taken regarding an application from MADHUSU'DANA GUPTA pandit, in favor of printing the Sanscrit translation of HOOPER'S Vade Mecum, suspended by the Education Committee.

Fifty copies of the Susrúta (2 vols.) were voted to MADHUSU'DANA for his trouble in correcting the proofs of that work.

Meteorological Register, kept at the Assay Office, Calcutta, for the Month of December, 1836.

Day of the Month.	Observations at 10 A. M.							Calculated Humidity.			Observations at 4 P. M.							Calculated Humidity.			Register Thermometer Extremes.		Rain.	Wiud.		Weather.	
	New Stand. Barometer red. to 32°.	Old Stand. Barometer at 32°.	Thermometer in air.	Depression of wet-bulb.	Do. by Leslie's Hygro.	Dew point.	Hair Hygrometer.	Centesimal tens. of vapour by wet-bulb.	Ditto by dew-point.	Do. by hair Hygrom.	New Standard Barometer.	Old Stand. Barometer at 32°.	Thermometer in air.	Depression of wet-bulb.	Do. by Leslie's Hygro.	Dew-point.	Hair Hygrometer.	Centesimal tension of vapour by wet-bulb.	Ditto by dew-point.	Do. by hair Hygrom.	Cold on roof.	Heat in sun.		10 A. M.	4 P. M.	Morning.	Evening.
1	30,032	30,082	72,1	8,3	8,3	48,5	86,0	57	46		29,823	29,994	77,1	12,5	11,8	48,3	82,0	44	38		55,2	89,0		N.W.	N.	clear.	fine.
2	,042	,094	72,0	9,8	9,6	47,8	84,0	50	44		,927	,998	76,3	13,0	11,7	48 4	81,0	40	40		54,5	94,0		N.	N.	do	clear.
3	,052	,098	71,3	7,9	8,2	47,3	85,0	60	45		,906	,974	75,9	11,5	10,3	46 8	83,	47	38			106,0		N.	N. E.	do	cumuli.
4	,045	,090	71,3	7,9	7,5	55,0	82,0	60	58		,943	30,000	76,1	11,9	10,7	53 0	73,	45	47		53,8	93,0		N.	n.	do	clear.
5	,095	,127	69,9	5,8	6,4		88,0	69			,991	,042	75,7	12,6	11,7	54.5	81,	42	50		52,0			N.	N.	do	do
6	,125	,164	70,7	6,1	6,2	54,3	87,0	67	58		30,006	,064	75,5	14,0	12,7		80,	35				99,0		n.	N.	do	do
7	,144	,180	70,2	5,9	5,8	54,2	88,0	67	58		,022	,076	75,7	13,0	12,0	47,0	82,	40	38		53,5	90,0		w.	n.	do	do
8	,120	,160	70,0	5,8	6,0	54,2	86,0	69	59	70	,001	,057	74,6	11,3	10,3	50,3	76,	45	44	52	54,0	101,0		n.	n.	do	fine.
9	,108	,146	70,5	6,5	6,6	50,0	85,0	65	45	68	29,931	,040	76.0	11,8	10,7	49,7	74,	45	42	49	54,2	95.5		n.	ne.	do	clear.
10	,091	,134	79,5	6,7	6,4	50,5	85,0	65	53	68	,976	,032	75,1	12,6	11,1	51,0	73,	39	45	48	56'2	97,2		n'	n.	do	do
11	,063	,100	69,1	8,9	8,3	53,0	79,0	52	58	57	,945	,000	74,2	13,0	11,1	49,0	73,	39	43	48	54.2	83,0		n.	n.	do	do
12	,053	,096	68,9	9,7	9,3	49,2	78,	50	52	56	,932	29,987	74,0	12,7	11,3	49,1	72,	40	44	46	51,0	90,0		ne.	ne.	cirri.	do
13	,043	,083	68,3	8,7	8,7	50,0	79,	52	54	57	,956	,963	74,3	12.7	11,3	49,0	72,	40	43	46	51,2	80,2		N.	nw.	clear.	do
14	,036	,076	68,5	8,1	7,7	53,5	81,	55	61	61	,915	,792	74,3	12,0	10,7	50.5	76,	42	45	52	52,0	95,0		nw.	N.	do	do
15	,038	,078	69,0	7,6	7,1	52,5	82,	60	58	63	,914	,973	73,8	11,0	10,0		76,	45		52	54,0	90,0		n.	n.	do	cumuli.
16	,027	,064	68,9	6,3	6,1	53,5	86,	65	60	70	,906	,964	73,9	10,6	9,8	48,0	77,	50	41	54	53,0	95,4		nw.	nw.	do	clear.
17	,049	,087	67,5	6,3	6,3	53,0	84,	65	61	66	,887	,946	74,2	13,9	12,9	47,8	71,	35	42	45	50,0	87,0		N.	nw.	do	do
18	,022	,062	67,6	9,4	8,9	48,2	77,	50	52	54	,887	,946	73,8	12,0		52,0	73,	42	49	48	47,5	96,8		N.	nw.	do	do
19	,066	,098	67,9	6,3	5,7	54,3	84,	65	63	66	,908	,959	74,9	10,3	8,3	52,2	78,	50	47	56	52,0	102,8		N.W.	n.	do	cumuli.
20	,011	,048	69,5	5,1	5,6	52,0	84,	70	56	66	,869	,926	76,3	11,6	11,0	49,3	76,	45	41	52	53,0	96,5		N.W.	ne.	do	clear.
21	,017	,061	71,4	7,7	7,4	52,2	81,	60	53	61	,883	,941	75,7	10,6	9.6	53,2	77,	50	47	54	53,0	106,0		N. E.	N.	do	do
22	,005	,045	70,7	6,8	6,8	51,9	84,	65	53	66	,903	,960	75,8	11,4	10,4	51,6	76,	47	44	52	53.5	98,0		N.	ne.	do	do
23	,007	,046	70,7	6,6	6,3	51,0	84,	65	52	66	,876	,936	75,8	11,3	10,2	52,6	74,	47	46	49	52,5	110,0		nw.	n.	do	do
24	,008	,046	71,9	8,1	8,1	51,6	82,	60	52	62	,882	,949	77,9	12,9	5,2	54,0	72,	42	46	46	51,2			se.	ne.	do	do
25	,013	,046	69,1	6,9	7,0	56,5	81,	62	66	61	,890	,948	75,2	12,4	10,7	53,3	73,	42	49	48	50,0	91,1		n.	N. E.	do	do
26	,030	,046	69,9	7,9	7,3	52,3	82,	60	56	63	,898	,946	74,8	11,0	10,0	52,5	74,	42	48	49	52,0	98,0		nw.	n.	do	do
27	,130	,106	69,3	9,5	8,9	48,0	77,	50	49	54	,951	30,092	76,1	12,9	10,9	50,6	71,	40	42	45	51,4	92,7		N.	n.	do	do
28	,194	,162	69,9	7,5	7,1	54,8	81,	60	67	61	30,015	,060	75,6	11,9	10,0		73,	45		48	52,2			N.	N.	do	do
29	,124	,213	69,8	9,7	8,7		78,	50		56	,033	,075	73,9	13,4	11,5		70,	37		44	51,5	92,		N.	nw.	do	do
30	,024	,144	65,6	8,9	6,3	52.8	78,	50	64	56	29,954	29,999	73,3	13,9			69,	35		42	43,0	80,		nw.	nw.	do	cirrl.
31	,029	,048	65,3	9,6	9,0		78,	45		56	,889	,934	73.2	14,7	15,0		68,	30		41				N.	nw.	cirrocumulus	hazy.
Mean,	30,060	,098	69,5	7,6	7,3	50,0		59			29,931	29,989	75,1	12,2	10,7	50,5		42						gentle	N.	clear but not cold.	

The difference of the old and new Barometers this month, has been 038 and 058 at 10 and 4 o'clock respectively. The failure of the American ice towards the close of the month suspended the observation of the dew point. A fresh supply has since arrived. The hair hygrometer is a new instrument not yet very correctly graduated.

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